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Abstract

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Brian T. Kehl, Ph.D.

George Mason University

Dissertation Director: Dr. Charles K. Rowley

This dissertation examines and analyzes economic and political forces that influenced military base closures under the Defense Base Closure and Realignment (BRAC) process of the late 1980's and early 1990's. The research utilizes a qualitative approach to outline the public good nature of defense and describes the rapid shifts in power and authority that were necessary for the formation of four "independent" BRAC commissions. Win-set analysis demonstrates that outside forces played a large role in allowing self-interested politicians to relinquish control over pork-laden defense expenditures.

A quantitative approach, based on logistic regression, is used to analyze the significance and magnitude of economic and political variables that influenced the Pentagon and the BRAC Commissioners. Empirical findings indicate that politics was not removed from the process and that political variables were important in determining the probability a particular military facility remained open. Sensitivity analysis indicates

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that a measure of learning occurred over the four commission periods and that the individual services approached base closures from different perspectives. The findings of the empirical work are applied to the fiscal year 2002 military base structure using current political and economic data to provide a unique forecast of the military facilities most at risk for closure in 2005 – the next major base closure year. If closures proceed in a similar manner to BRAC, several political and economic variables will be important to determining which military bases remain open and which are closed.

The approach and unique findings presented in this work provide further evidence of the applicability of economic principles to non-market arenas such as politics and national security. The principles of self-interest, unlimited wants, and constrained resources provide important tools that can be used by social scientists to more fully understand the effects politics has on decision making in a market economy.

THE PENTAGON VS. CONGRESS: THE POLITICAL ECONOMY OF MILITARY BASE CLOSURES DURING BRAC

by

Brian T. Kehl

A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
the Requirements for the Degree
of
Doctor of Philosophy
Economics

Committee:

Director

Department Chairperson

Program Director

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Date: July 23, 2003

Summer Semester 2003
George Mason University
Fairfax, VA

The Pentagon vs. Congress: The Political Economy of Military Base Closures During BRAC

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University.

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The views expressed in this article are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U.S. Government

Dedication

This work is dedicated to my family. This year my wife and I celebrated 11 years of marriage - six and a half of those years I have been a full time student. To my benefit, my wife and children often gently remind me that the pursuit of academic studies should be balanced with family experiences. It is in the myriad of life experiences that we find the truly interesting questions, and sometimes, the associated answers.

Acknowledgments

My time as a PhD graduate student at George Mason University has been challenging, enlightening, frustrating, rewarding, and most of all worthwhile. I express sincere thanks to the Air Force for sponsoring my educational endeavor and allowing me the necessary time away from the "frontline" to complete my studies. I also wish to thank my dedicated committee chair, Dr Charles Rowley. He is truly an inspiring person who motivates those he works with to stretch to new heights. His insights, critiques, feedback, and suggestions have significantly contributed to the content and quality of this work. I also thank Dr. Thomas Stratmann and Dr. Stephen Fuller for their candid critiques and thoughtful suggestions.

My family deserves a large portion of the credit for getting me to graduation. They provided an innumerable amount of support on the home front and did more than their fair share to ensure I had the necessary time to complete course work and meet dissertation deadlines. I love you guys and appreciate all that you have done!

I also wish to thank my fellow classmates. You have been good friends, good study partners, and helped provide the motivation I needed to get through this program. I sincerely hope I get the chance to interact with you often on a professional and personal level. I wish you the best in your careers and in life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract

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Chapter 1: Introduction

> "...any discussion of the economic effects of a major disarmament programme would of necessity have to tackle the political problems, if only to explain how the disarmament programme came to be willingly initiated by the arm spenders."
>
> Gavin Kennedy

Topic Overview

The political and economic collapse of the Union of Soviet Socialist Republics (U.S.S.R.) in the late 1980's and early 1990's lead to an interesting asymmetric military condition, a world with only one superpower. Faced with a new role on the world stage, the United States (U.S.) government was forced to decide what it's economic and military position would be in the visage of a significantly reduced threat of major theater warfare. The diminished threat gave lawmakers an opportunity to shift funding from military programs to non-defense programs or to decrease the level of government spending. This "guns and butter" tradeoff has been specified by numerous economists (Mintz, 1992, p. 185) and indicates that an overall decrease in defense expenditures allows for increased private investment and greater economic prosperity. In an effort to take advantage of a possible "peace dividend," the U.S. Congress choose to decrease funds appropriated to the armed forces. Faced with reduced real budgets, the military recommended and Congress eventually agreed to reduce the infrastructure and manpower

of the armed forces. One of the Pentagon's stated objectives was to generate real savings that could offset military pay inequalities, increase research and development (R&D), and provide funds to acquire new weapons systems.

A significant issue with military reduction policies like closing bases and reducing manpower is the potential for economic and political actors to lose rents they have worked hard and spent significant sums of money to acquire (Tullock, 1975). Because spending on national security represents a large percentage of total discretionary spending (Figure 1), it is subject to a significant amount of influence by special interests – increasing the difficulty of canceling or scaling back federal programs (Arnold, 1979, Weingast, 1984).

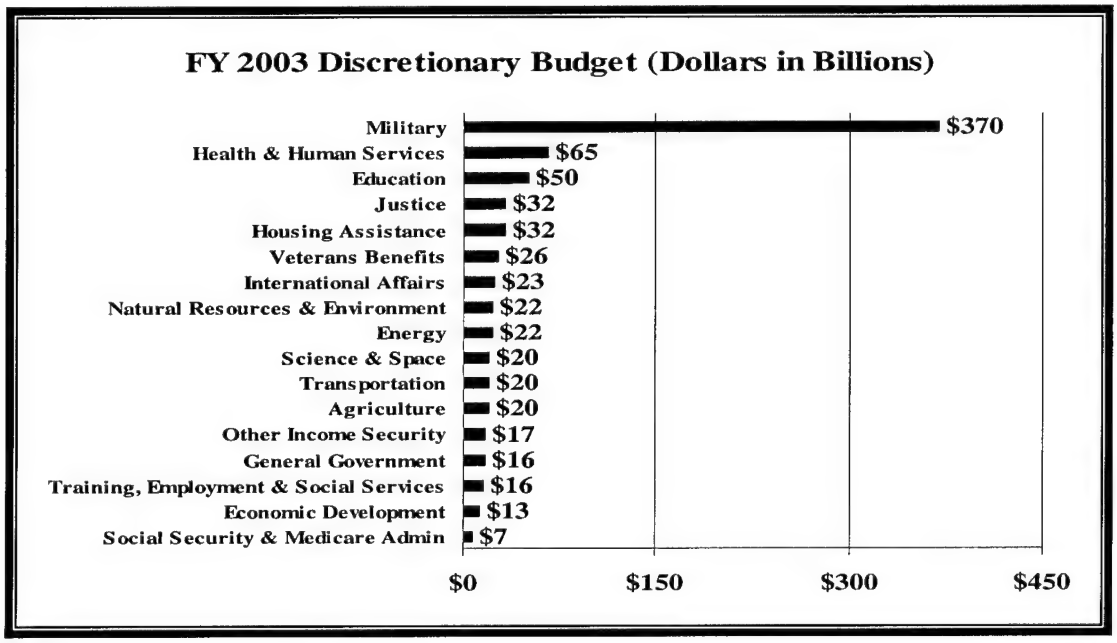

Figure 1. U.S. Government Discretionary Budget[1]

[1] Source: Office of Management and Budget and DoD. Discretionary budget excludes all "must pays" such as Social Security, Medicare/Medicaid, and interest payments to service the national debt.

Elected representatives are concerned about the local economic effects of closing military bases because the outcome can translate directly to votes on Election Day.[2] A 1996 report by the Congressional Budget Office (CBO) alludes to the political economy dynamics Congress considers when closing military installations:

> Because the Congress remains concerned about the local economic effects of closing bases, it could request further study of that phenomenon in order to provide an empirical perspective from which to consider additional base closings (CBO, 1996).

Self-interested politicians do not want to be held responsible for decreases in jobs and decreases in overall economic conditions among their constituents. For this reason, there are significant political variables that must be accounted for when any government program is reduced or cancelled. Base closures and realignments are no exception.

General Issue

Military base closures have taken place through various processes over the past 42 years. During the period 1961 – 1979, closures were implemented on an ad-hoc basis mainly by the Secretary of Defense with little to no involvement by Congress[3] (Bielling, 1996, p. 30-32). From 1980 – 1987, closure decisions were delegated to the individual service Chiefs and Congress strengthened its veto power.[4] These procedural changes lead to few major bases being identified for closure and none being closed (Twight, 1989, p. 78-79). Finally, between 1988 and 1995 Congress granted authority to an independent

---

[2] The positive impact that bases have on local communities has been empirically documented in both the short term (Henry and Oliver, 1987) and the long term (Mehay and Solnick, 1990).

[3] Congress maintained "limited veto" power; however, it was used sparingly.

[4] The strengthened veto power (unlimited veto power) was generally exercised ex-ante by including language in national defense legislation that would not allow the DoD to conduct studies on which bases to

Defense Base Closure and Realignment (BRAC[5]) commission to work with the Department of Defense (DoD) to identify bases and installations to the executive and legislative branches for closure or realignment (Tapp, 2001, p. 1). The BRAC process was conceived as a vehicle to inject a degree of integrity into the process of selecting which bases to close and realign as well as to discourage logrolling among congressional members which had hampered the ability to close bases through much of the 1980's.[6]

The BRAC process ultimately involved four rounds of base closures ('88, '91, '93, and '95); however, despite physical reductions in military facilities of 20 percent the DoD continues to request further cuts in infrastructure (GAO, 1998). The Pentagon wants additional BRAC rounds because there continues to be a significant disparity between support structure capacity and personnel levels (CBO, 1996). Despite the repeated requests of the Pentagon, Congress delayed providing additional BRAC legislation until the fall/winter of 2002.[7] Why in the face of reduced personnel levels, variable defense budgets, and increased threats of terrorism against U.S. facilities does there not exist a stable process for reducing unnecessary military infrastructure in order to make available needed funds? It is hypothesized that the answer to this question will be found by looking at political variables as well as traditional economic issues.

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close. Congress effectively used its appropriation and authorization power to "veto" possible closure actions before they could begin.

[5] The official name of the commission is the Defense Base Closure and Realignment commission; however, the commonly accepted reference is the Base Realignment and Closure commission (BRAC).

[6] The BRAC process temporarily suspended the "unlimited veto" power that Congress had exercised over the DoD during the early and mid 1980's.

[7] The Pentagon has been requesting additional closure rounds for excess military bases since 1998 and finally received authority in 2002 to proceed with additional rounds beginning in 2005.

Specific Issue and Contribution

Previous BRAC rounds lead to the decision to close 97 of 495 major installations worldwide and 261[8] total stateside activities and facilities (Siehl, 1996). Quantitative research indicates that generally these closures did not adversely affect local or state economies in the long run (Poppert, 2001). Future cuts will also likely be tempered because of federal transition assistance and the ability of local economies to use excess military infrastructure to attract new businesses. However, past and future cuts have the potential to significantly impact individual legislator's power. The loss of short and long term political clout in terms of discretionary budget power, committee assignments, and campaign funding from defense special interests are significant forces that influence closure efforts.

Previous qualitative and quantitative research has generally focused on the economic analyses of military base closures, with little work focused on the political maneuvers of the BRAC committees, Congress, the DoD, and the President. It is hypothesized that a significant reason for the limited work on political effects is the general belief that Congress structured the BRAC commissions in a manner that tied the hands of congressional members and special interests - effectively taking politics out of the process. A key objective of this work is to demonstrate that political effects were not eliminated from the base closure process. It's hypothesized that political variables, while diminished, did play a role in closing military infrastructure during BRAC.

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[8] Many of these closed facilities are not included in this study because they do not meet the definition of a major facility - one that employees at least 300 government civilians and military personnel. Many facilities were unmanned radar sites, dilapidated stand alone military housing complexes, and excess property sites where few or no personnel were assigned.

This work analyzes the decisions of the four BRAC commissions from a public choice perspective. Public choice applies economic principles to the political decision making process. It acknowledges that politicians operate in a redistributive world (Aranson and Ordeshook, 1981, p. 81-82), where scarce resources are allocated along self-interested motives. The public choice approach will be used to explain the behavior of politicians with respect to BRAC decision making and decreasing military infrastructure. The research objectives and associated hypothesis are as follows:

- Explain the political power shifts required for the formation of independent BRAC commissions. *It is hypothesized that Congress gave up power to close bases for many reasons, including self-interested ones. The use of Win-set analysis provides an economic based explanation of how Congress took control of base closures from the Pentagon and then temporarily gave up that power to four independent commissions.*
- Evaluate past BRAC closure recommendations from an economic/mission efficiency perspective. *It is hypothesized that many bases were selected for closure for predominately economic/mission reasons. BRAC provided significant incentives to close expensive unneeded facilities because of the possibilities of retaining the savings and directing them to other areas. It is hypothesized that economic and mission variables in the empirical model will be significant.*
- Evaluate closure recommendations from the Public Choice perspective to identify the role political forces played in base closure decisions. *It is*

hypothesized that a significant number of facilities were closed for both economic and political reasons. Because bases are closely coupled to local and state economies and because defense political action committees (PACs) provide significant contributions to elected representative, strong incentives exist for Congressman to retain military bases located in their districts. It is hypothesized that under the independent commission format, special interest variables will be significant.

- Predict which bases are most likely to close in the future if the same or similar process is used for additional closure rounds requested by the Pentagon. *It is hypothesized that the independent commission format can be used for future rounds that are authorized to begin in 2005. Using a model that includes political effects will provide reasonable projections because future closures will likely be stratified along political lines and will be influenced by perceived and real shifts in political power and political funding.*[9]

The qualitative and quantitative analysis in this work provides answers to each of these research objectives and hypothesis that is based on the political economy of national defense issues.

Dissertation Overview

This chapter provides the motivation to examine the BRAC process from and economic and political perspective and outlines the research objectives and hypothesis

[9] These results are hypothesized despite the recent pronouncements of Secretary of Defense Donald Rumsfield that all military bases will be considered in future rounds.

that are investigated. Chapter 2, Public Goods, Public Defense and Public Choice provides an overview of public goods and how defense and national security fall within the defining characteristics of publicly provided goods. It also sets the stage for a qualitative and quantitative public choice analysis of the interactions of Congress and DoD. Literature on principal-agent problems, bureaus, rent-seeking, logrolling, and special interests is set forth as a foundation for understanding the interactions. Chapter 3, The Political Economy of Closing Military Bases, summarizes the history of base closures prior to BRAC, outlines the development of BRAC, and uses win-set analysis to address how the BRAC commissions were formulated.

Chapter 4, Theoretical and Empirical Methodology, and Chapter 5, Quantitative Analysis of Base Closures, develops an economic/political model and applies logistic econometric regression techniques to an extensive data set on BRAC base closures to isolate economic, mission, and political variables that are relevant for determining the probability a base is selected for closure. Chapter 6, Sensitivity Analysis and Future Closure Projections, extends the quantitative work of Chapter 5 by stratifying the data by year of closure, service, and DoD defined major bases. It also uses the results of the empirical analysis to predict which bases are most likely to be selected for closure in 2005 if the same process is implemented. Chapter 7, Conclusions and Areas for Further Research, reviews the empirical findings and determines how well the stated research hypotheses have been answered. Policy guidance is given concerning how this research may be applicable to other high level DoD/Congressional interactions and areas for further research are recommended.

Chapter 2: Public Goods, Public Defense, and Public Choice

> "The conventional wisdom about Congress, at least as expressed by political journalists, is that some congressmen have used their positions in Congress to acquire substantial shares of military benefits for their constituencies"[10]
>
> R. Douglas Arnold

Chapter Overview

This chapter discusses the nature of public goods and examines national defense as a public good. Because large amounts of taxpayer dollars are spent on government provided goods in general and national defense specifically, suspicion lingers that public funds are spent with political as well as economic motives (Mayer, 1992, p. 15). The U.S. electorate has chosen to provide national security through collective action, therefore a working knowledge of public goods and their unique characteristics is provided as a foundation for understanding the political implications of the BRAC process.

The chapter also identifies public choice literature that is important to understanding congressional and bureaucratic interactions. Several strands of public choice literature are used to present the economic and political issues of providing public defense. Previous work provides a foil for understanding the competing interests that

[10] Congress and the Bureaucracy: A Theory of Influence, p. 95, 1979.

exist when an "independent" group, like the realignment and closure commission, is established to make policy recommendations that have the potential for political and economic impacts.[11]

Public Goods

The framers of the American Constitution were determined to place limits on the power held by the federal government. A governing system based on separation of powers was established with the intent to protect individual rights and property. The result of the framers work was a set of laws and institutional structures that provides numerous opportunities for citizens to own property. Because of amendments and judiciary interpretation, the Constitution is also used as a supporting document for federal and local government control of property. Economists refer to this type of joint ownership as public property (Hayek, 1973, p. 1-2). The modern theory of public property was developed by Paul Samuelson; however, 264 years ago David Hume realized that certain tasks could only be profitable accomplished by society.[12] These realizations lead to the theory of collective action; however, little was done to advance the theory until the 1930's when Paretian welfare economics helped us understand market failures.

A public good or collective good was defined by Samuelson as one "which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good" (Samuelson, 1954,

[11] The dollar impacts of BRAC recommendations are estimated by DoD, OMB, and GAO to be in the tens of billions of dollars - more than the annual budget of 70% of other discretionary funded departments.
[12] Hume, 1739.

p. 387). This definition demonstrates a major difference between private and public goods. With a private good it is possible to horizontally add up each individual's consumption to determine total consumption. Because total consumption is known, market forces can interact to align scarce resources to meet consumers demand – left side of Figure 2.

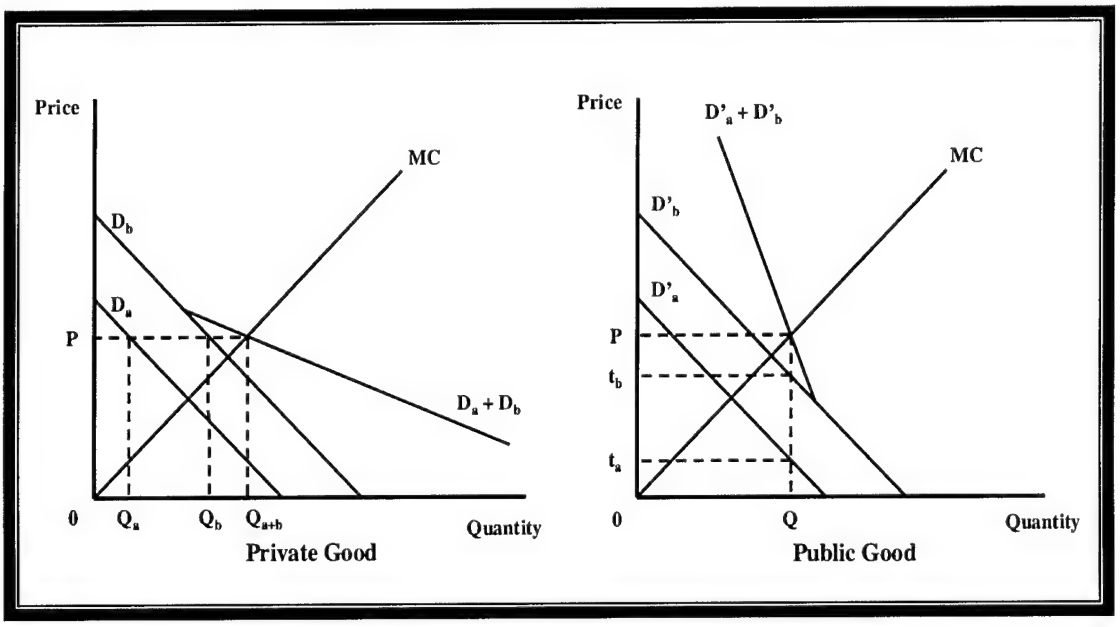

Figure 2. Demand for Private vs. Public Goods[13]

Horizontal addition is not possible with public goods because each individual is permitted to fully consume a good without determinant to another's ability to consume. In the public good case, the quantity provided is constant and the demand for the good is summed vertically to arrive at the national or local demand – right side of Figure 2.

[13] See John Cullis and Philip Jones's Public Finance and Public Choice, 2nd edition, p.46.

These differences lead to unique characteristics and considerations when public goods are evaluated. The following sections describe these unique characteristics which often lead to the public provision of national defense.

Nonexcludability and Free-Riding

A public good is generally defined by two characteristics that private goods do not posses. The first is nonexcludability. A good is nonexcludable if the benefits from the good are available to all once the good has been provided and the cost to exclude anyone from enjoying the benefits is prohibitively high. A good example of nonexcludability is a fireworks show because many people are able to watch from a distance without paying. Because the event is nonexcludable, the fireworks show may go un-produced, even in the face of strong demand. The fireworks example also demonstrates the problem of "free-riding."[14] When large numbers of people cooperate to provide a public good, it is easy for a few to follow a noncooperative strategy (Mueller, 1989, p. 13). Free riding exists when agents benefit from the provisioning of a good without bearing the costs (Shmanske, 1991, p. 31). Government provision of public goods, like national defense, tends to overcome the free riding problem; however, it also tends to lead to inefficiencies because it is difficult to determine the level of demand when preferences are not revealed. If the free riding problem cannot be solved by government or private firms, valuable services and goods may go un-produced.

[14] Preferences are typically revealed through wiliness to pay. Free riding exists because consumers can obtain desired amounts of the good without revealing their preference levels. Revealed preference problems generally lead to under provision.

Nondiminishable and Externalities

The second defining characteristic of a public good is nonrival or nondiminishable. A good is nonrivalrous when the benefits can be consumed without detracting from the ability of others to consume the same level of benefits. This occurs when the marginal cost to supply additional units is essentially zero. If one person's consumption does not lead to less for another person then the good is nonrival (Sandler, 1995, p. 4-5) and charging a price for that good or service is Pareto inefficient. Adding an extra unit of consumption provides a benefit to the consumer without imposing any costs, while the charging of a price would prevent some consumption.

Externalities occur when the activity of one individual or group changes the benefits and costs for another individual or group and these changes are not reflected in market prices. Pareto relevant market externalities are a reason often used to justify government intervention. Both positive and negative externalities exist. Examples of positive externalities include any benefit received by a third party at no cost – for example the benefit one receives when neighbors improve the appearance of their property. The overall value and aesthetics of the neighborhood increase at not cost to those who do not make improvements. A commonly cited negative externality is pollution. Water pollution from companies located upstream may impose a burden on the ability of those living downstream to obtain clean water. This increases the cost of using the water without a commensurate benefit.

One way to overcome externalities is to allow the government to intervene (Pigou, 1920). The hope is that a disinterested third party can bring about a Pareto-optimal

solution. Pigou suggests that the intervention can take the form of subsidies, taxes, or legislative changes to regulate the activities causing the externalities. A significant assumption of government intervention is that the government possesses all the relevant information to determine the correct levels of output, tax, and subsidy. Ronald Coase provides a neo-classical challenge to the role of government in overcoming externalities. Coase argues that Pareto-optimal outcomes can be worked out in some situations by those involved in the externality without government intervention no matter who owns the initial property rights. The Coase Theorem states:

> In the absence of transactions and bargaining costs, affected parties to an externality will agree on an allocation of resources that is both Pareto optimal and independent of any prior assignment of property rights

Industrialized countries contain numerous examples of goods that once were considered public now being provided by private firms. Technological advances have helped to decrease the transaction and bargaining costs associated with such transformations. However, many goods can not be provided without high transaction and bargaining costs. These goods tend to be provided by a public solution.

Public Good Typology

What most economists call "pure" public goods do not meet the stringent requirements defined previously.[15] In consequence; the typology of public goods has allowed economists to broaden the definition to include goods that only exhibit the nonexcludable feature (Frank, 2000, p. 626; Nicholson, 1998, pp. 742-743). What most

[15] The term "pure" refers to a good that is perfectly nonrival and nondiminishable. This is arguable a theoretical construct. One can always find an exception to the nonrival or nondiminishable criteria.

economists "loosely" refer to as public goods are impure public goods. Taxpayer funded highways are good examples of impure public goods. As long as the traffic volume is low, the highway is nonrival; however, if the traffic is high, the road losses its nonrival properties. Examples of goods that economists agree closely fit the pure public good criteria are national defense and the codification of laws and rules - Figure 3.

Examples of Public and Private Goods

Excludable	Diminishable: Yes	Diminishable: No
Yes	Clothes, Cars, Food (Private Goods)	Cable TV, National Parks, Highways
No	Ocean fishing grounds, clean air, public lands	National Defense, Law, Public TV (Pure Public Goods)

Figure 3. Public vs. Private Goods

Private vs. Public Provisioning

Private businesses often solve public goods problems by developing innovative ways to exclude non-payers - toll booths for roads, scrambled transmissions for electronic signals, fee-for-use police and fire protection services. Economists have found that private provisioning of public goods is more likely in small communities than in large communities (Buchannan, 1965; Olson, 1965). Tiebout agrees that the public goods

problem is more tractable on the local level versus the national level. He indicates that people can "vote with one's feet" by leaving communities that provide an undesirable level of public goods for communities that provide the desired level (Tiebout, 1956, pp. 416-424). Public goods are also privately provided by tying them to private goods. For example, membership dues charged by home owner's associations frequently provide neighborhood public goods by tying the cost to private ownership of a home.[16] Coase demonstrated that even a lighthouse can be privately provided by charging port owners (owners of fixed property rights) instead of ship owners (owners of easily moved assets). A private for-profit firm or agent can produce a public good if he possesses the means to exclude non-payers. If exclusion is difficult, costly, or not possible, production by individuals does not occur.

Within the traditional neoclassical framework, real and perceived market failures lead to government intervention through the production of public goods (Holcombe, 1997, p. 1). Even Adam Smith, a champion of laissez-faire, advocated the need for government intervention in the enactment and enforcement of laws and the provision of national defense. The neoclassical theory of public goods has allowed the introduction of an ideological wedge for government intervention (Block, 1999, p. 36). Therefore, it is important to draw distinctions between private and public goods. Cost comparisons reveal that private firms are able to supply similar goods and services as public organizations at significantly lower costs (Borcherding, Pommerehne, and Schneider, 1982). However, because of real and perceived market failures, not all goods are

[16] Neighborhood public goods include such items as swimming pools, parks, and jogging courses.

provided by the private sector. Externalities, free-riding and large transaction costs are significant motivating factors for limited government provision of goods when the number of individuals affected is large.[17]

Public Defense

National defense is the collective provision of means to thwart external threats. It is provided by the community and for the community (Kennedy, 1975, p. 40). It is one of the best examples of a public good as defined by neoclassical economists. Once a national defense system that provides deterrence is in place, the benefits are externalized because it is virtually impossible to exclude any one citizen from benefiting from the protection provided. The marginal cost to protect an additional citizen of the country once the borders have been secured is essentially zero. Because national defense is generally nonexcludable, strong incentives exist for non-cooperation and free riding.

Adam Smith was one of the first economists to seriously ponder on the method by which a nation should provide for its defense. He considered the tough questions of how to raise the revenue to provide for common security and how to legitimize the acquisition of said revenue. Writing in 1776 he said,

> The first duty of the sovereign, that of protecting the society from the violence and invasion of other independent societies, can be performed only by means of a military force. But the expense both of preparing this military force in time of peace, and of employing it in times of war, is very different in the different states of society, in the different periods of improvement (Smith, 1776, Book V, Chapter 1)

[17] Hoffman & Spitzer (1986) find deterioration in pareto-optimality in Coasian experiments when the number of participants rises above approximately 38.

Smith further indicates that when a laborer leaves his gainful employment or business to take up arms in defense of the state he looses his ability to earn a living and therefore must look to the state whom he is defending to provide for his maintenance. Smith identifies two basic methods to provide the labor required for defense - the volunteer militia and the standing professional army. When evaluating which method to pursue, the state should consider matters of efficiency from the perspective of the ability of the forces to wage war, not which method costs the least.[18] Smith concludes that wealth bearing nations rely on militias to their peril. In most cases they should fund a standing professional army where all citizens are required to help pay based on their respective abilities.

While Adam Smith advocated a standing army based on an efficiency of results consideration, Ludwig von Mises takes a government provisioning stance in the name of the protection of freedom. Mises indicates that the need to protect resources from the aggression of a country with fewer resources justifies state intervention.

> But as conditions are in our age, a free nation is continually threatened by the aggressive schemes of totalitarian autocracies. If it wants to preserve its freedom, it must be prepared to defend its independence. If the government of a free country forces every citizen to cooperate fully in its designs to repel the aggressors and every able-bodied man to join the armed forces, it does not impose upon the individual a duty that would step beyond the tasks the praxeological law dictates. ...He who wants to remain free, must fight unto death those who are intent upon depriving him of his freedom. As isolated attempts on the part of each individual to resist are doomed to failure, the only workable way is to organize resistance by the government. The essential task of government is defense of the social system not only against domestic gangsters

[18] Militias are often less efficient than standing armies because they lack the training time and resources of professional soldiers. Professional soldiers can more efficiently defend a nation than can part-time militias.

> but also against external foes. He who in our age opposes armaments and conscription is, perhaps unbeknown to himself, an abettor of those aiming at the enslavement of all (Mises, 1966, p. 282).

Mises continues his pro-government national defense reasoning by indicating that the maintenance of the government apparatus necessary to protect private property and private property rights can be funded by the levying of taxes and is fully compatible with the individual freedoms enjoyed by a free market economy. He does caution; however, that this train of reasoning should not be used to justify confiscatory or discriminatory taxation. Hayek agrees with Mises on the taxation issue. He argues that the infringement of private property by taxation is necessary because there is no property without law, which is financed by the collected tax (Hayek, 1979, p.44). In the absence of government provided defense, it is highly likely that defense would be underprovided or not provided at all. This process is demonstrated by a simple prisoner's dilemma matrix where the Nash equilibrium is for both parties to free ride.

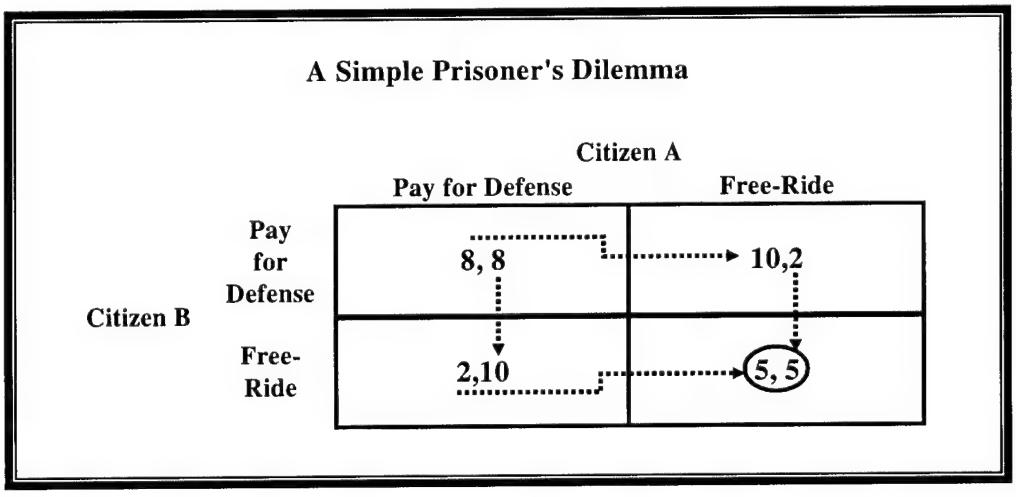

Figure 4. Prisoner's Dilemma Example

Deterrence from aggression tends towards an indivisible public good that is provided by defense and national security expenditures (Kennedy, 1975, p. 43). When a potential aggressor is deterred from attacking a nation there is little doubt that all benefit. However, when war breaks out the indivisible nature of defense is somewhat changed. When aggression occurs on a home nation, Kennedy likens national defense to a congested public highway. The aggression will cause the realignment of troops and equipment to the specific area under siege. The consumption of scarce defense resources in one sector to repel an invader comes at the expense of other sectors which must "consume" less protection.[19] Conventional deterrence seems to fit the "pure" public good definition while conventional warfare fits more in the "impure" public good category.

U.S. national security is provided by public provisioning though it doesn't always perfectly fit the definition of a "pure" public good. In theory, government provision will overcome free-rider problems and produce the "right" amount of defense. However, public choice economists have demonstrated that democratic governments operating under majority rule will generally provide too few public goods (Zycher, 1993, p. 662). Additionally, "The absence of a profit motive, and of an individual with a claim to the economic benefits from reductions in costs, weakens the incentive to minimize the cost of achieving given objectives" (Zycher, 1993, p. 666). Because resources are allocated to providing public goods, including national defense, by political mechanisms versus purely market mechanisms (Tridimas, 2001, p. 302), the public choice approach provides

[19] The contingency plans developed by military forces may involve abandoning some parts of the nation in order to defend more strategic or tactical locations. Additionally, some sectors of the country contain higher value targets and will likely receive a disproportionate share of protection.

a solid foundation for analyzing public good disarmament policies like military base closures.[20] The U. S. has chosen to make national defense a public good issue which means that public funds are used and that political representatives have considerable power over the authorization of military programs, personnel, and facilities. The public nature of defense opens the door to free-riding, externalities, and political pressure. The public choice discussion in the next section discuses ways economists have developed to evaluate the political aspects of economic and non-economic decisions. A discussion of these methods provides the tools necessary to understand how the BRAC process came to be and what forces influenced its recommendations.

Public Choice

When a country has a large number of enfranchised citizens and faces numerous issues direct democracy is improbable due to excessive coordination/transaction costs (Buchanan and Tullock, 1965, pp. 68-72). One option for large centrally governed States is a representative form of government where the polity chose members to make centralized rules and decisions. Public choice literature has focused on the representative democracy issue by looking at, among other issues, how elected representatives are influenced by special interests, principal-agent relationships, and how logrolling affects voting behavior. The tools of public choice provide an application of economic methods to the study of political process that shape government policy (Tridimas, 2001, p. 299). Following this line of reasoning, public choice advocates assume that elected representatives are rational economic actors who seek to maximize their utility - which

[20] Political mechanisms include lobbying, voting for parties and candidates, logrolling, and rent-seeking.

includes winning elections and increasing wealth (Downs, 1957, p. 28 and Borck, 1996, p. 147). It is assumed that politicians make decisions that are in part based on their own self-interest rather than solely on the interests of their constituents. This assumption is based on the economic principles of constrained maximization.

Politicians operate in a world of unlimited wants and scarce resources. They must make decisions based on the resources that are available at the time of the decision. This can lead to allocations based on self-interested motives, similar to decisions made by economic actors with limited budgets and unlimited wants. Because Congress alone has the power to raise and support public military forces, politics plays an important role in military base closures. The political aspects of military spending are more clearly understood by the application of public choice principals. Specifically this work looks at principal-agent problems, bureaus, rent-seeking, special interest, and logrolling.

Principal-Agent Problems

An agent is a person or organization who is employed to do work for another called the principal. The principal-agent term is ascribed to Ross (1973), and the literature address how principals motivate agents to act in the principal's interest instead of in a self interested manner. In most circumstances, the principal wishes the agent to take some action based on information that is available to the agent but not the principal. This asymmetric information problem leads to the principal not knowing if the agent has made the right decisions in representing the principal's interest. Often the pay-offs to the agent will differ from those to the principal so the agent will choose not to act in the best interest of his employer. The problem is one of economic incentives.

The principal-agent literature relates to the DoD in several ways. First, the DoD and Congress are agents to the citizens of the U.S. As principals, we expect an efficient level of defense and national security; however, because of asymmetric information, we often do not know if the agent is acting in our best interest. Second, the DoD is an agent to Congress and the President (through the Secretary of Defense) who are its principals. Congress delegates the responsibility and commensurate resources for military forces to the DoD. As the agent, the DoD often has separate goals from its principals. Because Congress and the President are not able to perfectly monitor the DoD, principal-agent problems arise. Third, the BRAC commission acted as an agent to Congress in recommending which bases should be closed and realigned. To fulfill this role, the commission relied heavily on data provided by the services. Because the services likely had their own agenda when it came to closing bases, the BRAC commission as an agent was susceptible to asymmetric information problems and may not have followed the goals of its principal – unbiased closure recommendations.

In principal-agent relationships, an agent can be incentivized in three general ways. First, tie output of the agent to something he cares about like pay or funding. Second, monitor the work – providing fines for slacking and bonuses for hard work. Third, set up the terms of the relationship to encourage high performers to self-select the principal as their employer. Congress uses all three of these techniques in its relationship with the DoD. Weapon production contracts and base maintenance are directly and indirectly tied to the output of the contract or the output of the base (number of sorties flown, number of divisions trained, number of exercises completed). Additionally, Congress monitors the

DoD through the requirement of senior leaders to provide testimony on various issues before defense and select committees and sub-committees. If Congressman are not satisfied with the Pentagon's response, funding and authorizations are decreased or cut. Third, Congress has currently mandated an all-volunteer force. This ensures that a specific type of person enlists in the armed forces of the U.S.[21] These recruits are motivated to serve their country so they are generally willing to work long hours at high efficiency levels with little additional compensation.

The differing goals of principals and agents explain a great deal of why Congress feels the need to monitor the Pentagon when military bases are closed. The following mathematical formulation provides insight into how the level of monitoring is chosen when Pentagon funding is tied to how hard it works to provide adequate defense and to report on its activities.

Congresses (the principal) utility is:

(Eq 1) $$U_C = u(D, O)$$

where:

D = the money spend on defense goods and services and

O = the time spent engaged in activities that are not defense related

the constraints are:

(Eq 2.1) $$D = f(W^{agent}) - C_d \text{ and}$$

(Eq 2.2) $$T = O + M$$

[21] 99% of U. S. military recruits have a high school degree or equivalent, and most career officers have graduate college degrees.

where:

C_d = the cost of defense in terms of personnel, bases and equipment,

$f(W^{agent})$ = the work ethic and responsibility of the agent; where W^{agent} is a function of the amount of time spent monitoring (M), the total time available to the agent (T^a), the fine imposed by the principal for slacking (F), and compensation which is part off the cost of defense (C_d)

T = total time available to the principal, and

M = the time the principal spends monitoring the agent

substituting the constraints (Eq 2.1 and 2.2) into equation 1:

(Eq 3) $$U_C = u(f(W^{agent}) - C_d, T - M)$$

and taking the derivative of equation three with respect to M provides the ideal level of monitoring for Congress:

(Eq 4) $$\frac{\partial U_C}{\partial M} = \frac{\partial u^C}{\partial D}\frac{\partial f}{\partial W^{agent}}\frac{\partial W^{agent}}{\partial M} - \frac{\partial u^C}{\partial O} = 0 \quad at \quad M^*$$

Note that the ideal level of monitoring (M*) occurs where the marginal benefit of monitoring equals the marginal costs of monitoring:

(Eq 5) $$\underbrace{\frac{\partial u^C}{\partial D}\frac{\partial f}{\partial W^{agent}}\frac{\partial W^{agent}}{\partial M}}_{Marginal\ Benefit} = \underbrace{\frac{\partial u^C}{\partial O}}_{Marginal\ Cost}$$

The mathematical formulation for the principals level of ideal monitoring indicates that in a risk neutral setting, the principal, if he chooses to monitor, will do so at the level where marginal benefits and marginal costs are equal (figure 5). Congress monitors the DoD based on this formulation. When the marginal benefit of monitoring is small, M* moves left and the DoD has more autonomy over its actions. M* was fairly small during

the 1960's and 1970's when the Pentagon had a great deal of control over base closures. M* moved to the extreme right during the early and mid 1980's when Congress choose

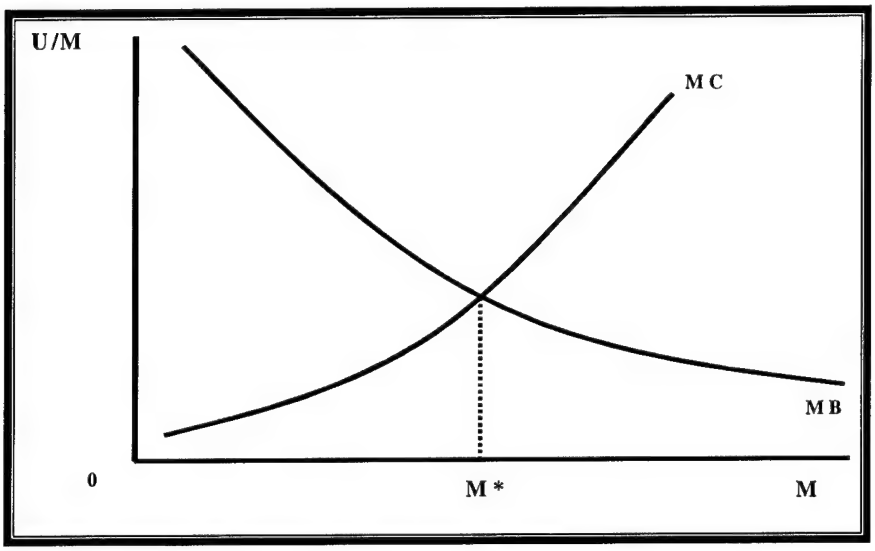

Figure 5. Congresses Ideal Level of Monitoring

to monitor all closure activities. The rightward movement was due to the rising marginal costs felt by politicians when large number of bases were closed and the increased marginal benefit to inject themselves into the base closure process. The mathematical formulation provides a motivating factor for why Congress changes its level of monitoring (base closures) over time – it is concerned with the costs and benefits of the Pentagon's actions to cut large numbers of military facilities.

Bureau's

Prior to public choice theory, the traditional view was that bureaucrats followed the orders of their political superiors or that they simply did what was "correct." However,

public choice scholars (Tullock, 1965; Downs, 1967; and Niskanen, 1971) demonstrated that these motives are not the only forces which influence and direct bureaucrats. Bureaus often exercise considerable discretion in the design and implementation of policy. This occurs for several reasons. First, monitoring is never perfect. Because bureaus posses asymmetric information, it is impossible for them to be punished for every error in policy implementation. Second, bureaus are given a great deal of discretionary power over policy implementation. This is often due to expertise possessed by the bureau which is gained by unique time and place information. Third, politicians often delegate discretionary power to bureaus to avoid having to make controversially decisions. Following Niskanen (1971) and Weingast and Moran (1983), we assume that a bilateral monopoly relationship holds between federal bureaus and the U.S. Congress. Niskanen argues that bureaucrats desire increased power, bigger discretionary budgets, and greater influence on public policy. Larger budgets lead to better opportunities for promotion, better working conditions, higher levels of non-pecuniary compensation, and expanded missions. One way bureaus are able to get a portion of what they want is through the asymmetric information they posses. Asymmetric information can be used for agenda control or selective efficiency[22] (Wintrobe, 1997, p.431). Recent quantitative analysis supports these qualitative statements by demonstrating that bureaucratic institutions matter in budget and policy formation (Robinson, 2001, p. 253).

[22] Selective efficiency refers to the ability of bureaus to control outcomes by being efficient at things they want to do while being inefficient at things the bureau does not want to do.

The relationship between the DoD and Congress follows the theory set forth by Niskanen's bureau literature. "Because each military service is likely to have better information than does Congress about the cost of providing a given defense service, efforts to maximize budgets can lead to the provision of defense at a higher cost than necessary" (Zycher, 1993, p. 666). Bureau literature would seem to indicate that the DoD would not want to decrease its base structure because this would be correlated with a decrease in power, budget, and influence. However, the DoD budget is not based on the number of bases that the military operates. It is developed by mission needs that satisfy national military strategy and the personnel and weapons systems required to accomplish these military and political objectives.

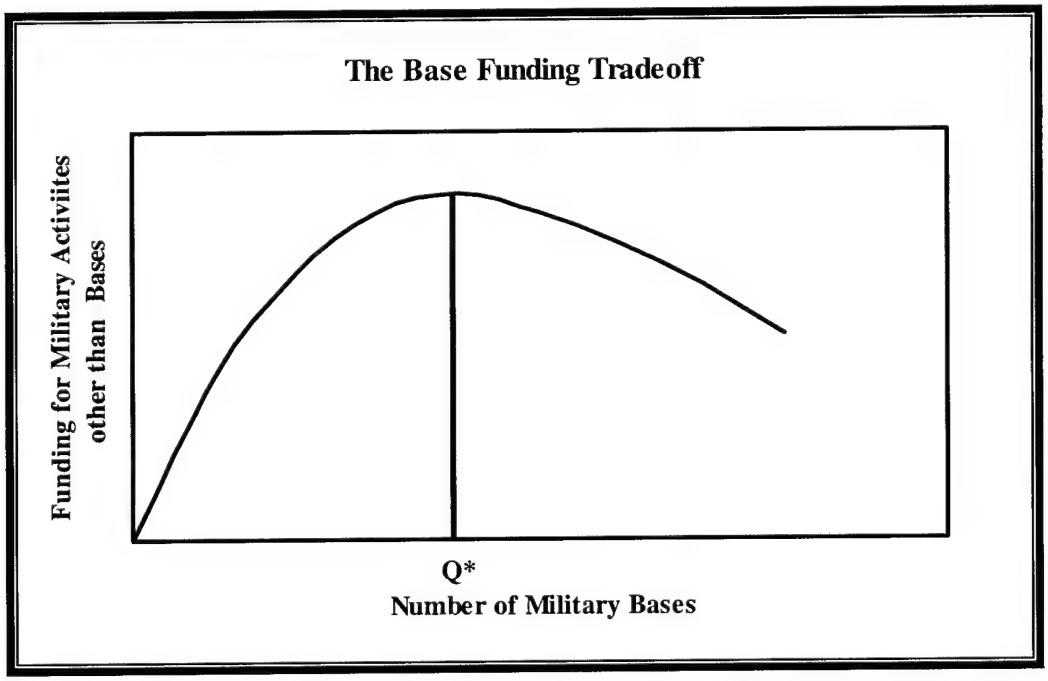

Figure 6. Base Funding Tradeoff

The budgetary power of the DoD is appropriated and authorized by Congress and is directly related to the total force structure, not the base structure. Excess base structure, defined as base structure beyond that needed to meet national military objectives, is a draw on the budgetary means of the DoD leading to fewer funds for personnel, new missions, and weapon development programs – Figure 6. Prior to BRAC rounds, the Pentagon found itself on the portion of the curve that falls to the right of Q* (the optimal number of bases that would allow for efficient funding of other activities within the DoD). This location was inefficient because it lead to spending on bases that was beyond that needed to meet the demands of national strategy. The Pentagon saw that a move to Q* would free-up needed resources and therefore strongly pushed for base closures.

While the Pentagon is penalized in terms of lost budget capabilities for maintaining additional infrastructure, Congressman secure employment and votes in their districts from keeping local bases open. Military employment pumps millions of dollars into local economies every year (Arnold, 1979, p.95). Employment comes in two forms – workers at military bases and procurement contracts. Because the DoD and Congress are seeking different goals when it comes to bases, bureau literature provides a basis for understanding the competing interests and asymmetric information that formulate the DoD/Congressional relationship. With regard to base closures, the agent, DoD, has directly competing goals with its principal, Congress. The DoD wants to close infrastructure in order to move funds to more pressing areas and Congress wants to keep bases open to ensure political power and campaign contributions.

Rent Seeking/Special Interest

The rent seeking literature had its origin with an important paper by Gordon Tullock in 1967 entitled "The Welfare Costs of Tariffs, Monopolies and Theft."[23] Tullock's original contribution was the realization that resources are wasted when seeking protection or favors. National defense is not exempt from the effects of rent seeking. Unwanted weapons systems and base infrastructure are legislated and funded in order for legislators to obtain campaign contributions and ensure sufficient approval ratings for successful re-election bids. The result is that a few dollars are spent by special interests in return for huge contract awards and the retention of unneeded military infrastructure.

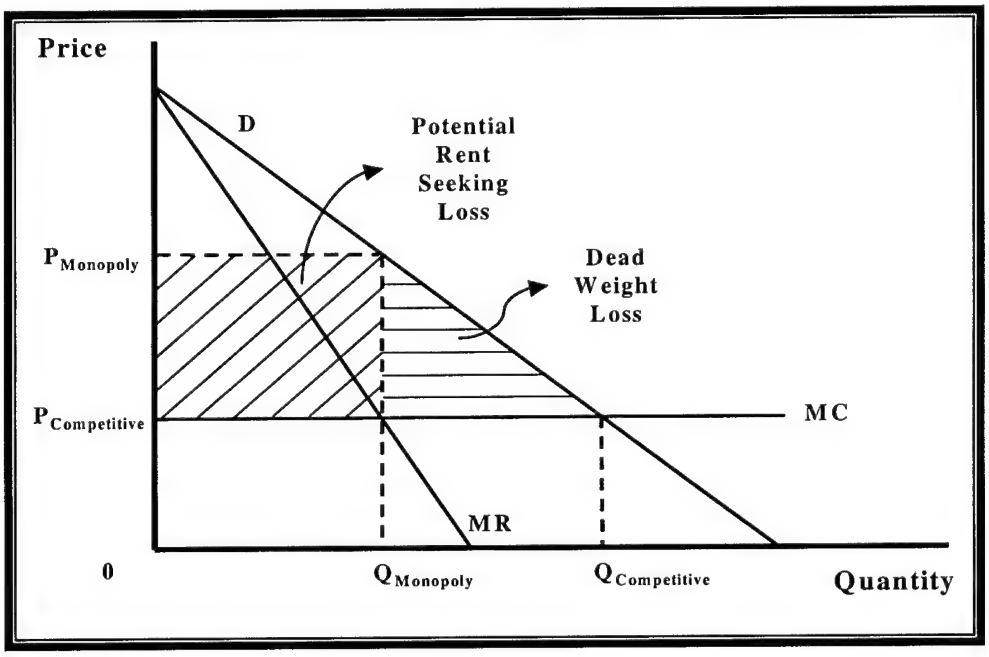

Figure 7. Potential Rent Seeking Loss

[23] The term "rent-seeking" was coined by Anne Kruger in 1974.

As Figure 7 demonstrates, some or all of the monopoly profits that would have been obtained from winning a large Pentagon contract or keeping a particular base open can be depleted in the competition to win. As the number of economic/political players in the competition increases, the total rent seeking will approach the total economic profit level. Mathematically, rent-seeking can be shown by the following:

(Eq 6) $$\Pi^e = \Pi\left(\frac{R_1}{R_1 + R_0}\right) - R_1$$

where: Π^e = the potential monopoly profits

Π = the prize from winning the monopoly

R_1 = the expenditures or efforts of firm/congressman one

R_0 = the expenditures or efforts of all other participants

Differentiating equation six with respect to R_1 gives the amount that will be spent by firm/congressman one to win the prize.

(Eq 7) $$\frac{\partial \Pi^e}{\partial R_1} = \Pi\left(\frac{R_0}{(R_1 + R_0)^2}\right) - 1 = 0 \quad at \quad R_1^*$$

solving equation seven for R_1:

(Eq 8) $$R_1^* = +/-\sqrt{\Pi R_0} - R_0 \text{ and by symmetry } R_0^* = +/-\sqrt{\Pi R_1} - R_1$$

substituting R_0 for R_1 gives:

(Eq 9) $$R_1^* = \frac{1}{4}\Pi$$

Each participant spends 25% of the expected prize, or 50% of the total prize for two participants, in an attempt to win. This analysis is extended to N participants by substituting equation ten into equation eight:

(Eq 10) $$R_0^{**} = (N-1)R_1^{**}$$

which leads to:

(Eq 11) $$R_1^{**} = \prod\left(\frac{1}{N} - \frac{1}{N^2}\right)$$

If N = 2, each participant will spend one-fourth of the prize, leading to half the prize being wasted by rent seeking actions. If N = 3, each participant will spend two-ninths, for a total of two-thirds of the potential profits exhausted by rent seeking.

The main losses of rent seeking arise because the process used to influence policy is costly and does not in-and-of itself generate value. Special interests are responsible for a significant amount of rent seeking in the provision of national defense. They use their influence to persuade elected individuals to arrive at outcomes that deviate from those demanded by the median voter. In The Rise and Decline of Nations, Mancur Olson (1982) gives a broad view of how rent-seeking organizations can alter the distribution of resources in a nation's economy. Olson writes:

> It would be in the interest of those groups that are organized to increase their own gains by whatever means possible. This would include choosing policies that, though inefficient for the society as a whole, where advantageous for the organized groups because the costs of the policies fell disproportionately on the unorganized (Olson, 1982, p. 37).

State congressional delegations represent a significant special interest for their state. One of their missions is to bring home federal tax dollars to the citizens they represent, so they

work hard to keep military bases in their state open, ensuring future flows of federal dollars, jobs, and votes. Additionally, lobbying by private defense interests weakens incentives for Congress to minimize the cost of defense. Despite indications that generally communities are not significantly hurt in the long run by base closures (Poppert, 2001), most elected officials chose to fight closings in their districts. This outcome is likely due to the fear of short term impacts (Kahneman and Tversky, 1981) and how those impacts translate into political support. Studies show that voters are influenced by short term prosperity rather than by long term gains (Tufte, 1978).

The motivation to achieve short-term gains opens the door to rent-seeking. Specialized defense good and services have lead to several major corporations becoming dependent on defense work. These firms have invested considerable capital and manpower to build up their capabilities and therefore have a vested interest in the amount of the federal budget that flows to defense goods. Similarly, many local economies tailor their output to meet the demands of military installations. Both of these groups have invested scarce resources in order to produce a particular mix of goods and services which leads them to be particularly concerned with how military bases are closed and realigned. These groups have an economic incentive to strongly encourage their elected representatives and anyone else in the decision making process to keep their base open, no matter what the economic costs is to society as a whole. This incentive is possible because a small group of people are able to receive a significant benefit without bearing the full costs because they are spread to a larger group who does not necessarily benefit

from their portion of the expenditures. This concentrated benefits, diffuse costs problem arises often in the provision of public goods like national defense.

Logrolling

Democracy, as established in the United States, permits each eligible citizen to express their desires and wishes through the voting process. A limitation of this method is the inability for citizens to legally express their preference intensities. A citizen who strongly desires a particular ballot measure casts a vote that is equal in degree to a citizen who is indifferent to the issue. When dealing with private goods, pareto-optimal allocation are made possible in part by preference intensities which are revealed by economic actors in the form of their purchase decisions (Mueller, 1989, p.82). In contrast, voting on public issues does not reveal the intensities of preferences, unless a provision exists for vote exchange.

Legislators may influence their colleagues to vote a particular way on specific legislation by the use of logrolling - the "trading" of votes by elected representatives. Logrolling is used to persuade legislators to vote for outcomes they are indifferent about in return for receiving votes on legislation they care about. The trading or buying and selling of votes in a general election is outlawed in all democracies; however, the idea that legislators may trade votes has been around for hundreds of years (Mueller, 1989). That vote trading happens on a regular basis indicates that legislators have different preferences for policy measures and that a great deal of these differences can be explained by economic self-interested models. Because U.S. legislators represent specific geographic areas, opportunities for logrolling or "bringing home the pork" are

large. Gordon Tullock (1959) has argued that majority rule combined with vote trading often leads to too much government. Indeed, pork barrel politics often leads to the spending of federal funds across several local projects that would not pass on their own merit.

Table 1 gives the benefits and costs of two theoretical defense projects. The two projects are a new fighter and the decision to retain an unneeded Air Fore base.

Table 1. Coalition Benefits and Net Benefits

Project	Coalition	Benefit	Cost	Coalition Benefit	Net Benefit
New Fighter	Fighter	10	7	3	-2
	Base	2	7	-5	
Retain Base	Fighter	4	9	-5	-2
	Base	12	9	3	

The Fighter coalition benefits (3) from the new fighter program because of increased employment in the districts where the prime and sub-contractors are located. The base coalition does not benefit (-5) because the base is closed and there is a loss of federal funds to its district members. Overall, the net benefit is negative (-2) because the increase in benefit to one coalition is more than offset by the loss of the other coalition. The same analysis applies if the base is retained and the new fighter is not begun. Placing the benefit and net benefit payoffs in a prisoner's dilemma matrix leads to the Pork Barrel Dilemma.

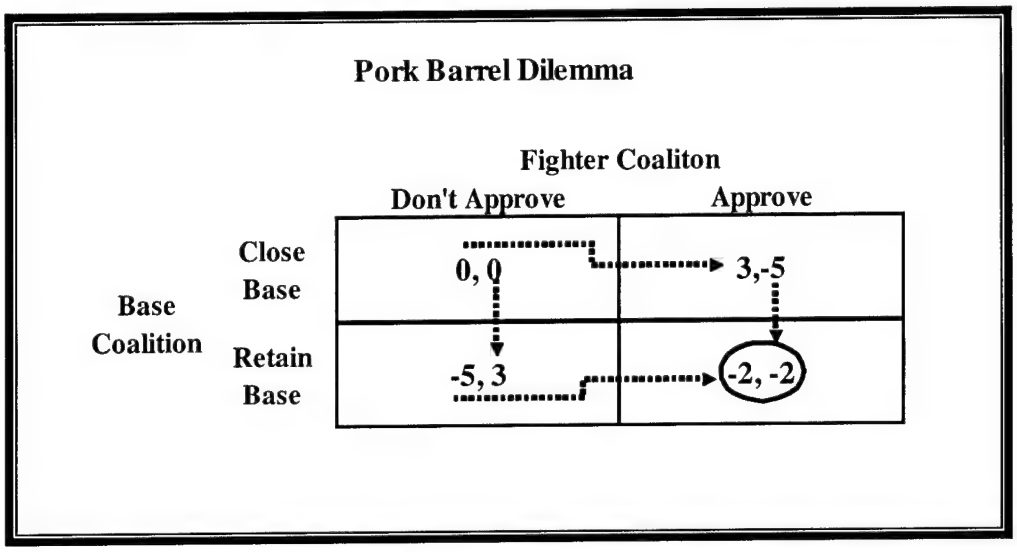

Figure 8. Pork Barrel Prisoner's Dilemma

Table 1 demonstrates that if the two projects are voted on individually neither would be approved because the net benefit of either one is negative; however, when logrolling is possible, both projects will likely pass (Figure 8). The projects are approved because each coalition gains a positive benefit and is therefore willing to vote for the other coalitions project in exchange for reciprocity. The prisoner's dilemma outcome occurs because both projects pass when neither should have been approved.

Majority rule, geographic representation, and logrolling combine to provide numerous examples of military infrastructure remaining open long past the time the military needed. One example is Loring AFB in Maine.[24] President Carter wanted to close Loring in the late 1970's but removed it from the Pentagon closure list because he needed Senate votes to ratify the Panama Canal Treaty. One of those votes came from

[24] Loring was closed during the BRAC process ('91), providing anecdotal evidence that the commission was able to remove a measure of the previous logrolling that had frozen the base closure process.

Maine's Senator Muskie who was wavering on how to vote on the treaty until Loring was removed from the list. Once the base was removed, Senator Muskie was quick to vote for the Canal Treaty (Sorenson, 1998, p. 118).

Loring AFB is a good example of an outcome that resulted from logrolling. The base remained open despite the services making a strong case that it no longer had a mission, and that it would be economically prohibitive to keep it open.[25] It is also an example of how difficult it is to prove that logrolling occurs. There was no paper trail or recording that could unequivocally prove that President Carter and Senator Muskie swapped votes. There is only anecdotal evidence that has no merit in a judicial proceeding. Despite moral dilemmas and the inability to prove specific cases of logrolling, it does exist and will play in any efforts to close bases.[26]

Summary

Because defense expenditures and activities can be classified as both pure and impure public goods, public choice economics provides a good method for analyzing the economic and political aspects of military issues. Several Public Choice research strains are applicable to the study of military base closings and the associated literature provides a solid foundation for the need to include political variables in any attempt to understand how BRAC commissions functioned and how future closures will proceed. Although

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[25] Loring AFB was a strategic bomber base that was designed to launch nuclear equipped B-52 bombers within 15 minutes of a war notice. The bases mission evaporated with the demise of the Soviet Union. Additionally, the extreme weather in the form of 105" of annual snow fall made it difficult and expensive to keep equipment and runways operationally ready - other bomber bases were cited as able to perform the same mission at less than half the cost.

[26] Direct vote trades are most feasible in settings where the number of participants is small as in the committee structure of the U.S. Congress, or small commissions.

economic variables likely played an important role, it is hypothesized that the political effects discussed in this chapter may have overridden some economic and mission considerations.

Chapter 3. The Political Economy of Closing Military Bases

> "The military is the dog that gets wagged by the tail when it comes to base closure…Operating base structure is expensive as hell. You don't win wars with base structure, but with weapons systems. We always want to close more bases than we can get away with. But we always get zinged by the political community."[27]
>
> Gen John Herres

Chapter Overview

The Pentagon's efforts to close military bases over the past 40 years has been influenced, guided, and hampered in varying degrees by the U.S. Congress. The political economy of disarmament addresses this influence and its effect on the bureaucratic organization charged with providing national security to the U.S. Whenever it has been politically feasible, Congress has refused to give the Pentagon free-reign on large-scale base closures. Whether real or perceived, Congressman often state that their districts and constituents will be irreparably affected when a base closes. While local economic effects do play a role in the closure process (Poppert, 2001); politicians, bureaucrats, and special interests play more interesting roles.

The previous chapter outlined public choice methods that can be used to analyze the interactions of the DoD, Congress, the President, and BRAC commissions. These tools

[27] Dismantling the Cold War Economy, Ann Markusen and Joel Yudken. New York: Basic Books, p 195, 1992.

help explain why Congress is so interested in the military base reduction process. This chapter provides a brief background of base closures, outlines the 1988 - 1995 base realignment and closure processes, and applies public choice theory to explain the power shifts and political posturing that occurred by both the executive and the legislative branches.

A Brief History of Base Closures Prior to BRAC

Military base closures are not a new phenomenon. In times of war or increased threats of aggression, the size of military forces tends to increase; while force size decreases in times of peace and immediate following the end of conflict. This cycle leads to the need to open and close military facilities as the force structure changes. Historically it has been relatively easy to open new bases. Increased threat levels justify the new facilities and the economic benefits to the community are welcomed. Closures, on the other hand, have been more difficult to implement. The potential loss of economic and political rents provides a powerful incentive for interest groups to strongly oppose base closures – particularly bases with a large number of employees.[28]

Since the conclusion of World War II, the Pentagon has been in the mindset of closing unneeded infrastructure. Despite this mindset, by the early 1960's the DoD still controlled more than thirty million acres and operated more than seven thousand facilities[29] (DoD, 1963, p.47). In 1961 unneeded infrastructure lead Secretary of Defense

[28] Large bases have been defined in various BRAC reports and literature as those with more than 250 to 300 DoD employees. The empirical model (chapter five) will only consider bases with more than 300 DoD personnel.

[29] Many of these facilities were unmanned radar and navigational aide sites or recruiting offices. Major facilities numbered in the hundreds not the thousands.

McNamara to initiate procedures to review all military facilities - leading to the closing of more than 700 installations over the next three years (DoD, 1967, p. 56). The number of closures was important because it prompted Congress to intervene in the process. Alarmed by the large number of facilities selected for closure, Congress sought to curtail the DoD through its appropriation and authorization powers. Specifically, the 1966 military construction authorization bill was used to slow the process. The bill contained specific language that no domestic military facility with employment of more than 250 military or civilian workers could be reduced in mission or closed until 120 days after the secretary of defense had reported the details and justification to the armed service committees (Cong Rec, 1965, 19421). The intent of the legislation was to protract the process of closure, allowing politicians an opportunity to protect military funding earmarked for their districts.

Congressional approval to close military bases was publicly argued on the need to maintain separation of powers. Many Congressman, on both sides of the aisle, expressed concern that the president was in effect utilizing an item veto when he closed bases without congressional review (Cong Rec, 1965, 22973). From a public choice perspective, Congress was worried about loosing control over large public expenditures that had direct effects on reelection bids.[30] If there did not exist a review process controlled by Congress the legislative branch feared they would be at the mercy of the executive branch, allowing rents to be extracted in the form of legislation favorable to the

[30] U.S. military installations employ a large amount of the nation's defense labor force. In 1991, more than two million people were employed at military facilities. Payroll and operating costs for these facilities consumed 32% of defense outlays and 6.5% of total federal outlays.

administration. Over time, President Lyndon Johnson and Congress came to a compromise. The compromise was necessary because the President realized that he would likely loose a great deal of control over military base closures if he did not move in the direction of his peers in the legislature. The Presidents movement away from his ideal (maintaining almost full closure authority) towards Congress is explained by the use of a public choice tool called win-set analysis.

Win-set analysis provides a method to explain how a structured induced equilibrium can quickly change – leading to large movements in the equilibrium point over relatively short periods.

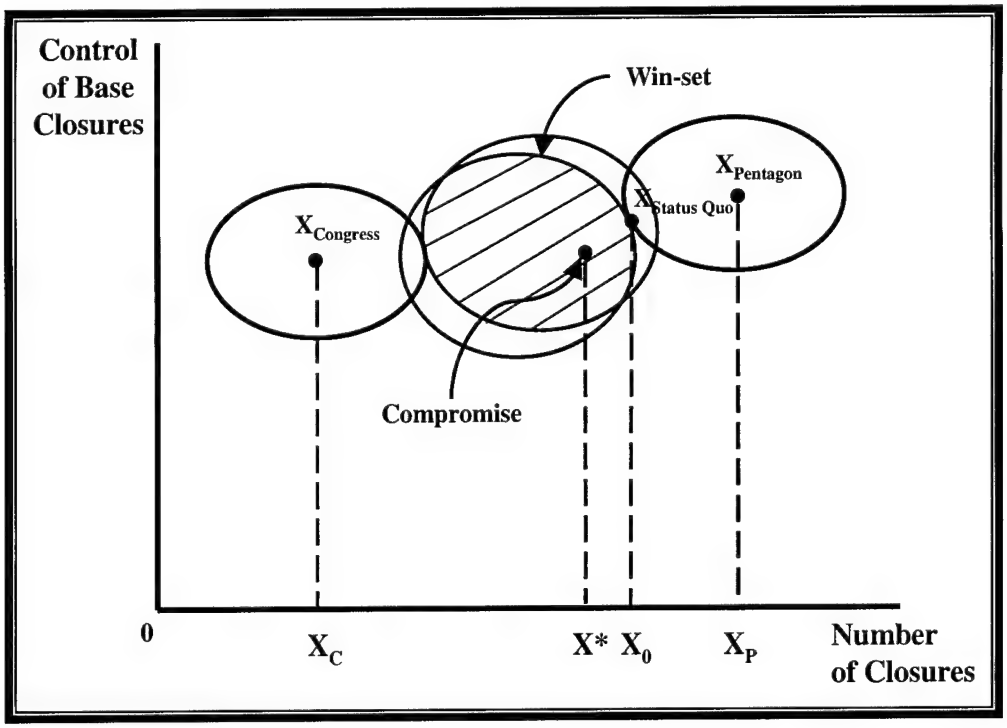

Figure 9. Win-Set Analysis - 1960's Closures

Figure 9 provides a graphic representation of the ideal positions of Congress (X_C) and President Johnson/Pentagon (X_P) with regards to number of base closings and control over the process. The Pentagon wanted to control the process so that it could quickly meet national military objectives by rapidly closing unneeded infrastructure. It also wanted to be able to close a large number of facilities, if needed, to support national security objectives and free up scarce appropriation authority. Conversely, Congress did not want to close a large number of facilities due to rent-seeking and the influence of special interests. While Congress does have an interest in controlling the closure process, this interest is generally smaller than that of the Pentagon. Congress has many national and domestic issues on its agenda, so it does not have the time to review all closures and completely control the process. It is only interested when there are a large number of closures that have significant political impact; therefore, it is often willing to give up control of the process to the Pentagon. Also represented in the win-set analysis is the status quo position (X_0) and the compromise position (X^*). Movement to the compromise position occurred because Congress inherently possessed the power to move the status quo to a point that took almost all power away from the Pentagon and the President. President Johnson realized that if Congress made a large move he would loose a great deal of political power; therefore, he was willing to compromise and allow Congress to regain a measure of control over the closure process. Although this move is labeled as a "compromise," it was made for self-interested reasons – the retention of political power by the President and the Pentagon.

Despite the small compromise shown in Figure 9, base closure frustration continued to fester during the mid 1970's as bases were selected for closure after the end of the Vietnam conflict. President Gerald Ford announced in 1976 that the Pentagon had plans to close or realign 160 domestic bases. This announcement quickly lead to bipartisan legislation by members of Congress whose districts and states would be most affected.[31] The legislation sought to remove the ability of the Pentagon to decrease military infrastructure; however, when the original legislation was unsuccessful, it was modified to severely limit the ability to close bases by requiring numerous time intensive studies and environmental impact evaluations. The modified legislation successfully stopped the closure of facilities with greater than 300 workers between the years 1976 and 1988. Not surprisingly the legislation was sponsored and supported by Congressman who represented bases that had appeared on previous Pentagon lists.

Although the Pentagon tried on several occasions to offer up large facilities for closure, key Congressman and Senators were able to use logrolling and support from special interests to block all closures efforts of bases with more than 300 personnel. This moved the status quo from X_0 to X^* (Figure 10) giving Congress essentially complete control over the number of major bases closed.

[31] A large number of Congressmen formed the Northeast-Midwest Coalition in 1976 to oppose the closures proposed by President Ford. The group claimed that their 16 states had 45 percent of the countries population, paid 49 percent of federal taxes, and only received 17 percent of Pentagon spending on personnel. The coalition spent a good deal of time trying to increase congressional control over the base closure process (Northeast/Midwest Coalition, 1977, 2054).

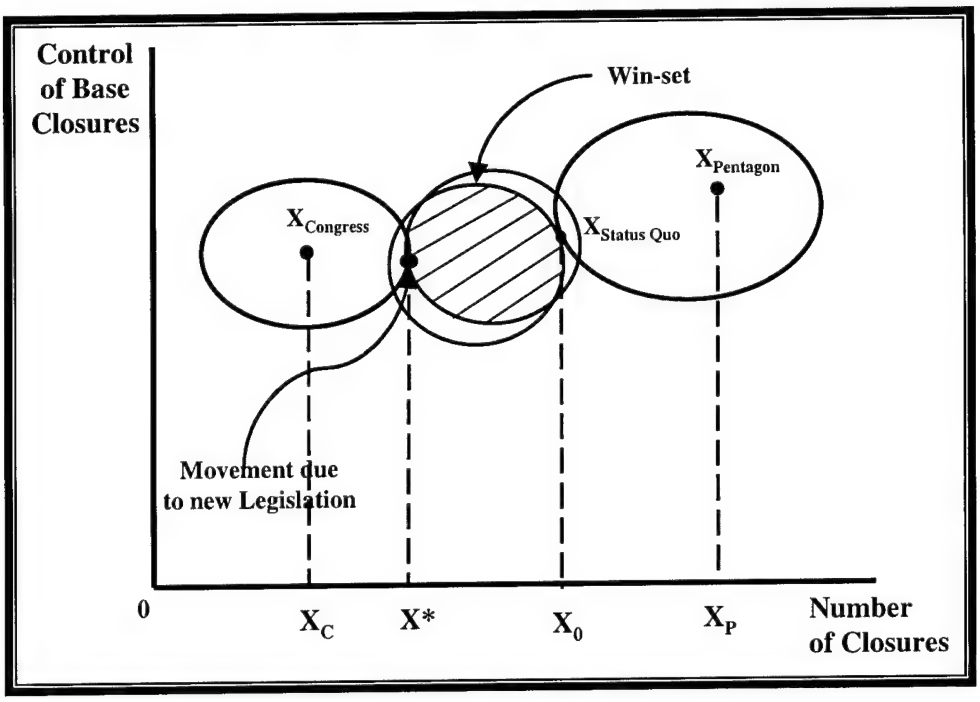

Figure 10. Win-Set Analysis - No Major Closures

Modern Base Realignment and Closure Efforts

The issue of closing military bases demonstrates the classical struggle between the legislative and executive branches of the U.S. government. The DoD and the President want to close excess base infrastructure without interference from Congress, while Congress wants to retain its constitutional power to raise and support a military. Congressmen's primary interest in military facilities is drawn from the economic benefits of employment levels (Arnold, 1979, p. 95). Congressmen are also interested in the political power they may lose if a military base is closed. Despite these competing interests, politicians were compelled to acknowledge that fewer bases would be needed to perform post-Cold War missions. The need to close facilities was due in large part to

economies of scale – DoD personnel levels had shrunk by 43 percent compared to 1968 but base structure had not (Poppert, 2001, p. 10). Everyone involved in the process realized that some form of base closures was eventually going to be necessary, but no one could figure out how to take enough of the politics out off the process to get effective legislation passed. As the country progressed through the 1980's, the burden of maintaining a large military infrastructure when it was not needed began to take it toll on readiness, quality of life, and weapon systems modernization plans.

Texas Republican Dick Armey shocked the House of Representatives in 1987 when a measure he introduced to close bases came within four votes of winning a floor amendment to the defense authorization bill. The amendment proposed creating a blue-ribbon panel to implement base closures (Cong Rec, 1987, 11920-11924), taking away from Congress the power to make line-item modification or rejections from the panel's recommendations. The proposal, which would have significantly decreased the political process that had become evident in base closures, nearly passed for many reasons. First, Armey proposed a single round of cuts with a forecasted savings of up to $5 billion annually (Cong Rec, 1987, 11921). Second, the timing of the proposal was excellent. The national debt was rising at an exponential rate, defense budgets had been rising at alarming rates during the Regan build-up, and money was desired for new social programs. Third, there had been no reductions in base structure in over ten years and Congress was becoming very cognizant of the need to make some infrastructure cuts; but it had failed to define a process that would allow members to lay down their self-interests. Fourth, Armey was a new representative who was not well known, not on any

military related committees, and probably most important, had no military bases in his district. Armey's relatively apolitical position and the ability to make him the "fall guy" if the process was unsuccessful, allowed him to outline a credible process. Many Congressman saw in Armey's plan a potential way to decrease the military infrastructure with little risk to any individual member.

Though defeated in 1987, Armey proposed his measure again in 1988. Despite gaining additional allies, there was still strong opposition to a commission format.[32] Armey's amendment was referred to the Armed Services, Government Operations, and Merchant Marine and Fisheries committees. These three committees made numerous amendments that were intended to derail the proposed closure process. The amendments included: stringent environmental regulations that required expensive clean-up efforts, a requirement to pay for the preservation of historical facilities and buildings, and an amendment to close all excess foreign bases before any domestic bases were considered. Armey quickly recognized that the amended legislation would make it more difficult to close excess infrastructure than the current law. To counter the amended legislation, Armey proposed a new amendment that replaced the original language of the bill and made a compromise with his most vocal opponents.

The new amendment, which passed on July 12, 1988, made the following concessions (Cong Rec, 1988, 17762):

[32] Most opposition came from legislators who had bases in their districts identified for possible closure on earlier lists proposed by the Pentagon. They felt if the Pentagon had previously picked their base, they would be the first to go under an independent commission.

- Congress retained its ex-ante veto power by reserving the right to reject the entire list of closures by a simple majority vote
- A partial waiver of the strict environmental regulations was given versus the full waiver sought by the Pentagon
- BRAC commissioners were subject to confirmation by the Senate, and only half of the BRAC commission staff could have worked for the DoD over the past year

The conference report easily passed both houses in Oct of 1988 and the first commission was initiated. In a further effort to appease Congress, the DoD nominated Abraham Ribicoff and Jack Edwards, former Congressman, to be the co-chairs of the commission.

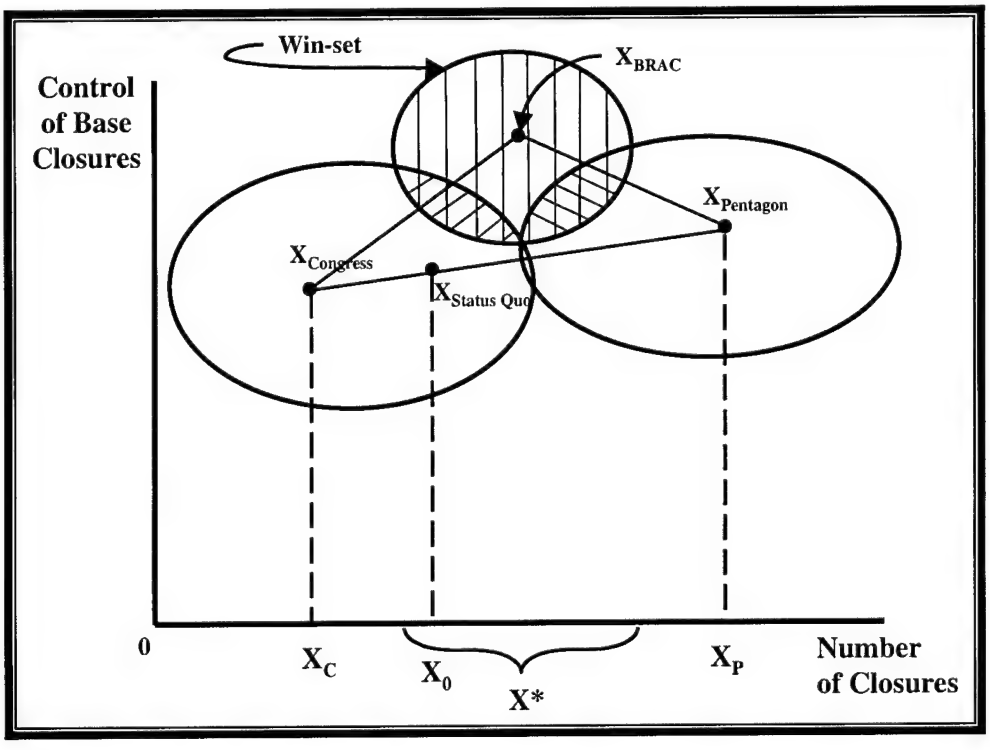

Figure 11. Win-Set Analysis - Introduction of the BRAC Commission

Figure 11 graphically depicts the introduction of the BRAC commission into the power-play of base closures. By giving the BRAC commission authority to recommend base closures, Congress permitted the Status Quo (X_0) to move to the right – allowing closures to proceed. The new win-set (X^*) includes the entire utility curve around the BRAC position because only the commission had the authority to add and delete bases from the Pentagon's recommendations. This "final authority" power effectively eliminated any possibility of cycles that normally occur when multiple players are functioning in two-dimension space. The two small shaded contract lenses indicate the points that Congress and the Pentagon/President would prefer the BRAC commission choose. The analysis demonstrates that Congress wanted fewer closures (lefts shaded area) and the Pentagon would prefer more closures (right shaded area). Because the President and Congress did retain the authority to disapprove recommended closures in there entirety, there was an incentive for the BRAC commissioners to move towards the intersection of the three utility curves.

In the 1988 round, the BRAC commission tended to move towards the Pentagon/BRAC contract lenses as the commission made no changes to the Pentagons recommended closures. In later rounds, the BRAC commission tended more towards a compromise position as a number of Pentagon recommendations were altered by the commission – some bases remained open and others were added. The learning that occurred over the four closure rounds demonstrates that Congress and the Pentagon were able to use asymmetric information, special interest influence, and possibly logrolling to somewhat influence the BRAC process.

The commission format was structured so that the bureau that held asymmetric information on military bases, the DoD, would make recommendations about which bases should be closed. The commission was to be the agent of Congress because it retained the power to make line item additions or deletions to the service's recommendations. Congress (the principal) hoped that this format would act as a type of penalty to the services (the agent), encouraging them to make the proper choice of closures on their own. Because the commissioners were approved by Congress, and because Congress retained ex-ante veto power over the closure list, the independent commission format allowed Congress to exercise a measure of political control. It can be argued that the commission process was effective because a significant number of bases were eventually closed, which was a major change from the previous ten years. The question answered in later chapters is did politics continue to influence the process?

The Commission format also allowed Congressman a way to vocally defend their bases while the BRAC commissions were closing them. Bases could be closed with only the limited possibility of repercussions in the next voting cycle because Congressman affected by the closure process could point their finger at the commission. They could also vote against passage of the closure list when it came before Congress for approval. The beauty of Armey's process was the ability to close unneeded infrastructure and blame independent commissioners who did not have to worry about re-election, contributions, or public backlash for their actions. Win-set analysis provides an excellent approach to understanding the self-interested forces that motivated Congress to relinquish power to the BRAC commissioners. Further, it provides a good answer to the first

research question presented in chapter 1 – how did power to close bases changes hands so often in such a short period? The self-interested action of the parties involved indicates that even in a somewhat structured induced equilibrium, large shifts can and do occur.

BRAC 1988

The initial BRAC commission was designed to be a group of nonpartisan members who would follow a specific charter (Poppert, 2001, p. 11). The group was composed of 12 commissioners and 48 support workers. The commissioners came from a broad background including military, corporate, and public service. Their charter was to: request recommendations from the Pentagon, evaluate the information, make appropriate adjustments, and make an independent recommendation to the President. BRAC legislation limited the Presidents options; he could disapprove the list in its entirety or approve it and forward it to the Hill. Congress was also restricted in what it could do once it received the list of closures from the President. If it did nothing for 45 days, the recommendations became law (OSD, 1998). Its other options were to veto the entire list or approve the recommendations by simple majority. No line item additions or deletions were allowed.[33]

At the time of the first commission it was not know if additional closure rounds would occur. This set up a one-time interaction scenario that the services may have tried to exploit. The commission format however, likely discouraged the one-time interaction

[33] Giving up line item addition/deletion authority was significant. This power had allowed numerous bases in the 1980's to remain open because committees could make changes to initial legislation to favor themselves or other member of Congress in return for favorable votes on separate issues. While Congress did retain ex-ante veto power, it was effectively nullified by the requirement to obtain a majority to overturn.

approach because of line-item veto and addition power. This power provided a check to the services and forced them to make reasonable closures that could be substantiated by the independent commission. The commission released its report on December 29th 1988. The report recommended the closure of 86 bases, 16 of which were major U.S. bases – meeting the criteria of 300 or more personnel (Table 2). The commission also recommended the partial closure of 5 bases and the realignment of 54 bases. The total effected bases was 145 (Hellman, 2001, p.30).

Table 2. 1988 BRAC Major Base Closure Recommendations[34]

State	Service	Military Base	Recomm by DoD	Added by Comm	Deleted by Comm
California	Army	Presidio of San Francisco	X		
California	Air Force	George AFB	X		
California	Air Force	Mather AFB	X		
California	Air Force	Norton AFB	X		
Illinois	Army	Fort Sheridan	X		
Illinois	Air Force	Chanute AFB	X		
Indiana	Army	Jefferson Proving Ground	X		
Louisiana	Navy	Naval Station Lake Charles	X		
Kentucky	Army	Lexington Blue Grass Army Depot	X		
Massachusetts	Army	Materials & Mechanical Research Ctr	X		
New Hampshire	Air Force	Pease AFB	X		
New York	Navy	Naval Station, New York (Brooklyn)	X		
Pennsylvania	Navy	Naval Hospital, Philadelphia	X		
Texas	Navy	Naval Station, Galveston	X		
Utah	Army	Fort Douglas	X		
Virginia	Army	Cameron Station	X		

[34] Source for all four years (Tables 2, 3, 4 and 5): Carroll's Military Facilities Directory (Spring 1998) and Defense Almanac (1997).

As shown in Table 2, the 1988 Commission accepted the recommendation of the DoD with no modifications. This occurred for many reasons: First, the recommendations were relatively easy to make. Major bases selected were those that had substantial economic or mission encroachment problems. They were easy choices that most players in the process could readily agree on. Second, the BRAC process was new and there were only a few months for the independent commissioners to review the Pentagon's list before they were required to submit their recommendation to the President and Congress. Future commissions would have considerably more time to review the recommendations of the Pentagon – allowing political processes an opportunity to be influential. Third, the short time frame did not allow special interests and rent-seekers an opportunity to pressure legislatures and commissioners. Once the commission submitted its report the commission was disbanded. Congress had only provided authority for one independent commission and its work had been accomplished.

BRAC 1991

Following in the footsteps of the 1988 Commission's work, Defense Secretary Dick Cheney submitted further closures to Congress in 1990. However, the chairmen of the House Armed Services Committee, Rep. Les Aspin (D), rejected the list indicating that the proposed closures were disproportionately located in the districts of Democratic representatives (Hollman, 2001, p. 31).[35] Rep. Aspin declared that the only way to continue closing bases in a fair manner was to pass legislation authorizing further

[35] Rep. Aspin (D) was undoubtedly concerned that DoD and the President (R) possessed asymmetric information and were attempting to use that information in a favorable manner to close bases in Democratic

independent commissions. Congress agreed and passed Public Law 101-510, the Defense Base Closure and Realignment Act of 1990. P.L. 101-510 directed three additional closure rounds – '91, '93, and '95, which would coincide with non-election years. Additionally, the size of the commission was reduced to eight commissioners who were selected by the President with the consent of the Senate – the President was to consult with the House speaker in appointing two members, the Senate majority leader for two others and the House and Senate minority leader on one each. Unlike the 1988 legislation, the President could not veto the recommended list. He could approve and send it to Congress or return it to the Commission for further consideration.

In April of 1991, the Pentagon released its recommend closure list to the Commission. The commission worked on the list and released its recommendations to the President in July of 1991. President Bush approved the list on July 10th 1991, and three weeks later the House defeated a measure to reject it.[36] The closure list included 82 bases, 26 of which were major closures. Table 3 shows the major bases that were selected by the DoD.[37] It also shows the additions and deletions that were made by the 1991 BRAC Commission. The commissioners made five changes to the Pentagon's recommended closure list. They added Naval Station, Puget Sound in Washington and deleted Fort McClellan in Alabama, the Naval Training Center in Florida, Moody AFB in

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districts. This would benefit the special interests associated with the Republican Party and make it harder for Democratic incumbents in districts with closed bases to be re-elected.

[36] House Joint Resolution 308. The vote was 60 to 364 in favor of accepting the closure list.

[37] Note: Although 26 major closures occurred in 1991, Table 2 lists 27 closures – MacDill was initially recommended for closure but not closed because of the destruction to Homestead AFB in the Miami area by hurricane Andrew. The DoD choose to close Homestead rather than rebuild the devastated base. For purposes of this work, MacDill is treated as being selected for closure because it was the base selected by the services and approved by the commission.

Georgia, and Naval Air Station (NAS) Whidby Island in Washington. It is interesting to note that three of the four deleted bases were represented on the Senate Armed Services Committee – the exception being NAS Whidby Island. Although MacDill AFB in Florida was selected by the DoD, it did not close due to the destruction of Homstead AFB by hurricane Andrew.

Table 3. 1991 BRAC Major Base Closure Recommendations

State	Service	Military Base	Recomm by DoD	Added by Comm	Deleted by Comm
Alabama	Army	Fort McClellan	X		X
Arizona	Air Force	Williams AFB	X		
Arkansas	Air Force	Eaker AFB	X		
California	Air Force	Castle AFB	X		
California	Army	Fort Ord	X		
California	Army	Hunters Point Annex	X		
California	Marines	MC Air Station, Tustin	X		
California	Navy	NAS, Moffett Field	X		
California	Navy	Naval Station, Long Beach	X		
California	Navy	NISE West	X		
California	Army	Sacramento Army Depot	X		
Colorado	Air Force	Lowry AFB	X		
Florida	Air Force	MacDill AFB	X		
Florida	Navy	Naval Training Center	X		X
Georgia	Air Force	Moody AFB	X		X
Indiana	Army	Fort Benjamin Harrison	X		
Indiana	Air Force	Grissom AFB	X		
Louisianna	Air Force	England AFB	X		
Maine	Air Force	Loring AFB	X		
Massachusetts	Army	Fort Devens	X		
Michigan	Air Force	Wurtsmith AFB	X		
Missouri	Air Force	Richards-Gebaur ARS	X		
Ohio	Air Force	Rickenbacker IAP AGS	X		
Pennsylvania	Navy	Naval Station Philadelphia	X		
Pennsylvania	Navy	Philadelphia Naval Shipyard	X		
South Carolina	Air Force	Myrtle Beach AFB	X		
Texas	Air Force	Bergstrom AFB	X		
Texas	Air Force	Carswell AFB	X		
Texas	Navy	NAS, Chase Field	X		
Washington	Navy	NAS, Whidby Island	X		X
Washington	Navy	Naval Station, Puget Sound		X	

The work of the commission was also legally challenged for the first time in 1991 when Senator Arlen Specter (R-PA) and other members of the Pennsylvania delegation filed a law suit in federal court over the closure of the Philadelphia Shipyard (Palmer, 1991). Their hope was to save the large amount of federal jobs and dollars that were generated by the shipyard.

Compared to 1988, the 1991 Commission was much more active in changing DoD recommended major facility closures – zero versus five. As the empirical model will demonstrate, part of the reason was the learning that had transpired from the 1988 round. Additionally, the commission process was much longer in 1991, allowing the influence of special interests to come to bear on a larger scale.

BRAC 1993

By 1993, the political landscape surrounding base closures had dramatically changed. The Republicans had lost the White House to the Democrats and the new Secretary of Defense, Les Aspin, was a former chairman of the House Armed Services Committee. Secretary Aspin was the Congressman who in 1991 claimed that the Pentagon's list had been partisan favoring the closing of bases in Democratic districts. He now controlled the Pentagon and any recommended closures. Evidence that logrolling and special interests had influence over the process became evident when internal Pentagon recommendations were leaked to the *New York Times* about a week before the commission was to get the official recommendations. Congressman whose bases were on the list lobbied hard over the next week for their removal.

Table 4. 1993 BRAC Major Base Closure Recommendations[38]

State	Service	Military Base	Recomm by DoD	Added by Comm	Deleted by Comm
Alabama	Army	Fort McClellan	X		X
Alabama	Navy	Naval Station Mobile	X		
California	Navy	Mare Island Naval Shipyard	X		
California	Navy	NAS, Alameda	X		
California	Navy	Naval Aviation Depot Alameda	X		
California	Navy	Fleet & Industrial Supply Center	X		X
California	Navy	Naval Hospital, Oakland	X		
California	Navy	Naval Station Treasure Island	X		
California	Navy	Naval Tng Ctr, San Diego	X		
California	Marines	MC Air Station, El Toro	X		
Connecticut	Navy	Naval Sub Base, New London	X		X
Florida	Navy	NAS, Cecil Field	X		
Florida	Navy	Naval Aviation Depot Pensacola	X		
Florida	Navy	Naval Training Center	X		
Hawaii	Navy	NAS, Barbers Point	X		
Illinois	Navy	NAS Glenview	X		
Illinois	Air Force	Chicago-O'hare IAP ARS	X		
Maryland	Navy	Naval Electronic Sys Engr Act	X		
Massachusetts	Navy	NAS, South Weymouth	X		X
Michigan	Air Force	K.I. Sawyer AFB	X		
Mississippi	Navy	NAS, Meridian	X		X
New Jersey	Air Force	McGuire AFB	X		X
New York	Navy	Naval Station, Staten Island	X		
New York	Air Force	Plattsburgh AFB		X	
Ohio	Air Force	Gentile AFS		X	
Ohio	Air Force	Newark AFB	X		
Pennsylvania	Army	Def Pers Support Ctr	X		
Pennsylvania	Navy	Navy Aviation Supply Office	X		X
South Carolina	Navy	Charleston Naval Shipyard	X		
South Carolina	Navy	Naval Hospital, Charleston	X		X
South Carolina	Navy	Naval Supply Center, Charleston	X		X
Texas	Navy	NAS, Dallas	X		
Virginia	Army	Vint Hill Farms Station	X		
Virginia	Navy	Naval Aviation Depot, Norfolk	X		

Before the list was submitted to the BRAC commission, three California bases were removed – McClellan AFB in Sacramento, Long Beach Naval Shipyard, and the Presidio

[38] Homstead AFB was closed during 1993; however, the commission did not select it. It was closed because the base was severely damaged by hurricane Andrew.

of Monterey.[39] The special interests of California and its Congressional delegation were undoubtedly successful at bringing pressure to bear on the Pentagon.

Table 4 lists the major U.S. bases that were recommended in 1993 for closure by the Pentagon. It also lists the bases that were deleted by the BRAC commission and the bases that were added. Secretary Aspin's recommendations included 165 facilities, 31 major closures and 12 major realignments. As shown in Table 4, two bases were added to the DoD recommendations and nine bases were deleted by the Commission. Of the nine bases removed from the list, only one was not represented on the Senate Armed Services Committee or the Senate Defense Appropriations Committee. President Clinton approved the list, and not surprisingly, Congress could not muster the votes to block the closure process (Cong Rec 1993, 12003).

Between the 1993 process and the beginning of the 1995 round there were two issues concerning closures that came to fruition. First, Senator Arlen's Specter's law suit that had begun in 1991 came to a close when the Supreme court agreed with the federal district court and reversed the Third U.S. Circuit Court of Appeals. In May of 1994, the Supreme Court ruled unanimously against Specter stating that the 1990 statue concerning the closing of bases by an independent commission did not allow for judicial review of closure decisions. This ruling legitimized the authority of the independent commission and gave special interests and rent-seekers hope that if they could convince the commission that there base should be kept open, the President, Congress, and the Courts

[39] Two of these bases, McClellan AFB and the Long Beach Naval Shipyard, would be closed two years later by BRAC 1995. McClellan was an especially important victory as the base employed more than 13,000 people, 10,000 of which were civil servants.

would not be able to reverse the decision. Second, the House rejected a proposal by Republicans on the Armed Services Committee that would have delayed the 1995 round until after the elections of 1996. Politicians were very fearful that the 1995 closure would be the largest yet[40] and preferred to have their re-election efforts behind them before any pronouncements were made on further base closures (Idelson andTowell, 1994).

BRAC 1995

Predictions that the 1995 closure round would be the biggest and hardest to swallow turned out to be false, largely due to the armed services having trouble coping with all the previous closures and associated up front costs (Cassata, 1995, p.694). The new Secretary of Defense, William Perry, backed off from submitting a large number of closures. Additionally, political forces had once again changed. The Democrats were still in control of the White House, but the Republicans had won control of both chambers of Congress, leading to a potential showdown over base closures. The political decisiveness and looming 1996 presidential election led to Republican criticism of Secretary Perry's list. They indicated that Pentagon recommendations had strategically spared several key states that were necessary for President Clinton to ensure his re-election bid. Additionally, Dick Armey, who was now the House Majority Leader, charged that the Pentagon had spared particularly large Air Force bases that provided major aircraft maintenance because of the electoral votes associated with those states –

[40] Between 1985 and 1993, defense spending had declined by 30% while personnel levels had declined by approximately 27%. In contrast, the three prior commissions were only able to decrease infrastructure by about 20%. The problems of excess infrastructure had therefore gotten worse during the course of BRAC rather than better.

California and Texas.[41] The Portsmouth Shipyard in New Hampshire was also rumored to have been deleted from the Pentagon's list because of the importance of that state in the presidential primary.

Table 5 lists the bases recommended by the DoD for closure in 1995 and the associated changes made by the commission. The rumors that Secretary Perry had deleted two large Air Force Depots, McClellan AFB and Kelly AFB, before submitting his list were acted upon by the commission as it choose to add both of these bases to the list it forwarded to the President. Both state delegations, California in particular, lobbied President Clinton hard to reject the entire list to avoid closing the depots. Although he did not reject the list, President Clinton did vow to privatize the two depots ensuring that the majority of jobs would not be lost to closure. Although the president's actions saved the employees at these bases, it did little to decrease the excess capacity (52%) in the Air Force depot system.

Secretary Perry's recommended list included 146 facilities, including 28 major U.S. closures and 26 major realignments. On June 30th the Commission forwarded its recommendations to the President. The forwarded list contained 132 facilities, 25 of which were major U.S. closures and 21 major realignments. The commission added three bases to the list and deleted five of the recommendations of the Pentagon. All the deleted bases had representation on Senate Defense Committees – four on the Senate Armed Services Committee and one on the Senate Defense Appropriations Committee.

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[41] The bases at issue were McClellan AFB in California (already removed from the 1993 closure list before it went to the commission) and Kelly AFB in Texas. Both bases employed in excess of 10,000 civil servants engaged in the maintenance of a variety of Air Force aircraft. The closure of either base could have significant ramifications on presidential and congressional races in those states.

Table 5. 1995 BRAC Major Base Closure Recommendations

State	Service	Military Base	Recomm by DoD	Added by Comm	Deleted by Comm
Alabama	Army	Fort McClellan	X		
Alaska	Navy	Naval Air Facility, Adak	X		
Arkansas	Army	Fort Chaffee	X		
California	Army	Oakland Army Base	X		
California	Navy	Fleet & Industrial Supply Center		X	
California	Navy	Long Beach Naval Shipyard	X		
California	Air Force	McClellan AFB		X	
California	Air Force	Ontario IAP AGS	X		
Colorado	Army	Fitzsimons AMC	X		
Illinois	Army	Savanna Depot Act	X		
Indiana	Navy	Naval Air Warfare Cntr, Aircraft Div	X		
Kentucky	Navy	Naval Surface Warfare Center	X		
Maryland	Army	Fort Holabird	X		
Maryland	Army	Fort Ritchie	X		
Maryland	Navy	Naval Surface Warfare Center	X		
Massachusetts	Navy	NAS, South Weymouth	X		
Mississippi	Navy	NAS, Meridian	X		X
New Jersey	Navy	Naval Air Warfare Cntr, Lakehurst	X		X
New Jersey	Army	Mil Ocean Tml Bayonne	X		
New York	Air Force	Roslyn AGS	X		
New York	Army	Seneca Army Depot	X		
Ohio	Air Force	Springfield-Beckley MAP AGS	X		X
Pennsylvania	Army	Fort Indiantown Gap	X		
Pennsylvania	Navy	Naval Air Warfare Cntr Aircraft Div	X		
Pennsylvania	Air Force	Pittsburgh IAP ARS	X		X
Tennessee	Army	Def Depot Memphis	X		
Texas	Air Force	Brooks AFB	X		X
Texas	Air Force	Kelly AFB		X	
Texas	Air Force	Reese AFB	X		
Utah	Army	Def Dist Depot Ogden UT	X		
Virginia	Army	Fort Pickett	X		

As in past rounds, the commission was fairly active at changing a number of the major recommendations. The House national security committee defeated a measure to reject the list in July and the full house defeated a similar measure in September. The Senate did not raise a rejection resolution, passing the closure list by inaction. The BRAC closure process had finally ended. As anecdotal evidence presented in this work

and in the large amount of literature written about the process indicates, political variables played important roles in the Pentagon's recommendation process, in the BRAC commission process, and in the President's actions. In the following chapters, the empirical model will demonstrate that political variables were important, despite the independent nature of the commission.

Why New BRAC Rounds

The Pentagon is interested in continuing the BRAC process because of the annual economic savings that can be generated by closing unused facilities. It is relatively easy to make an argument based on decreased budgets and decreased personnel end-strength levels that the military is suffering from diseconomies of scale when it comes to real property and infrastructure. Several bases remain open for predominately political reasons at significant economic costs to the taxpayer and the readiness of U.S. military forces. In 1997, Secretary of Defense Cohen asked for two new rounds of base closures and realignments. He explained that while previous rounds had provided significant savings, it was important to continue the closure process and remove remaining underutilized facilities. Despite his request, most Congressmen were reluctant to support authorization of new base closure legislation due to grass-roots opposition from communities likely to be affected and President Clinton's "intervention" in the 1995 base closure commission's recommendations regarding McClellan and Kelly Air Force bases. Attempts to pass new legislation in 1997 and 1998 failed.

The base closing issue was revived again during the 106th Congress. On January 20, 1999, Sen. John McCain, along with Sen. Carl Levin and Sen. Charles Robb,

introduced legislation that would authorize two new rounds of base closures in 2001 and 2003. In February of the same year, the Clinton Administration submitted to Congress its budget for FY2000 which included provision for two more rounds in 2001 and 2005. In May however, the Senate Armed Services Committee in its markup of the FY2000 defense authorization bill rejected the proposals. In the following year Sen. McCain and Sen. Levin once again assumed the lead in calling for two new base closure rounds in 2003 and 2005. In June 2000, however, their amendment to the FY2001 defense authorization bill was defeated.

Win-set analysis provides a graphical representation of why a few Senators and the President were unable to budge Congress as a whole.

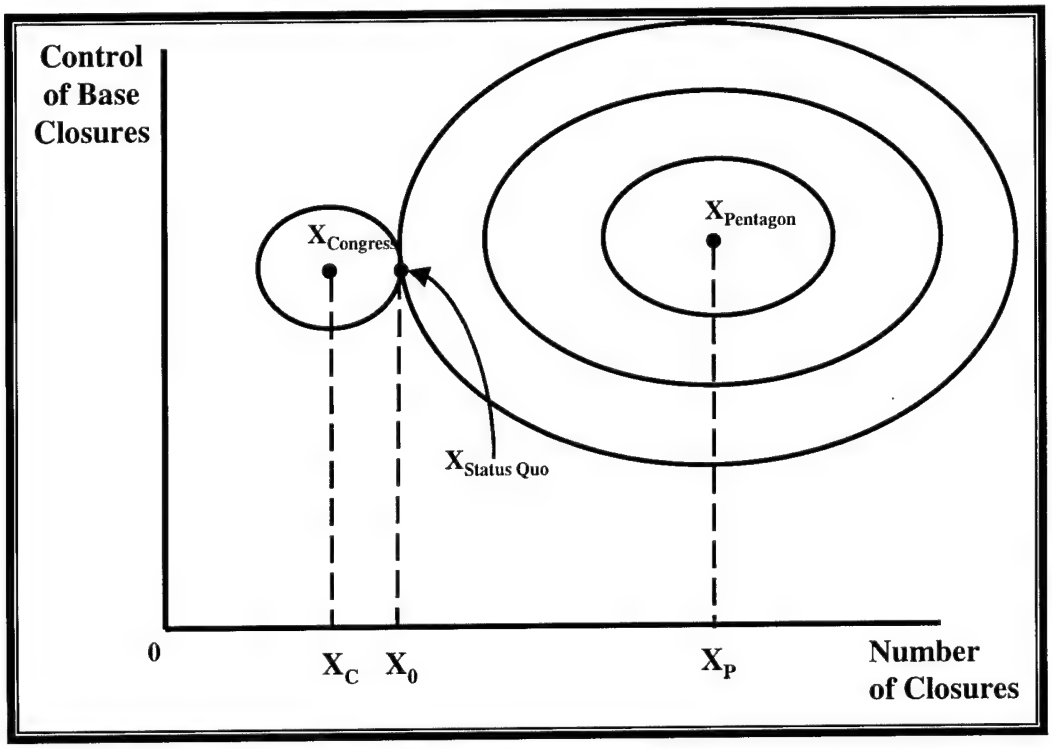

Figure 12. Win-Set Analysis - Full Control by Congress

As the analysis demonstrates, Congress was unwilling to move very far from its ideal point – one of little/no closures. Further, because congress alone holds the power to raise and support the military it could not be forced by other actors in the game to relinquish control. The first four rounds of BRAC had come in large measure from outside forces (declining budgets and personnel levels from the end of the Cold War) that had forced Congress to give up power and its own self-interested goals. The closure rounds had satisfied the outside forces, and Congress was able to take a strong self-interested position for the immediate future.

Despite the lack of broad support on Capitol Hill, senior DoD officials, as well as the President, continued to press for new rounds of base closures; however, nothing would happen until another outside force was able to circumvent the self-interest of Congress. That force was large scale terrorism on U.S. soil. The terrorist acts of September 11th 2001, began a process of military buildup that no one had anticipated. Funds to support constant deployments and new weapon systems required to perform counter-terrorism on a large scale needed to come from several sources. Once way the DoD saw to more efficiently use its current funding level was to re-open the BRAC process.[42] This would bring savings on two fronts, first from the closed facilities, and second from not having to increase security at as many military sites. The outside force of terrorism was enough for Congress to slowly alter its self-interests and authorize additional closure rounds that will begin in 2005.

[42] The DoD projected in 1998 that two more rounds of closure would save in excess of $3B per year after the closures were fully implemented (DoD, 1998, p. iv).

Summary of Findings

This chapter gives a brief overview of the BRAC process and provides anecdotal evidence that the process of closing military bases is based on both economic and political decisions and variables. Politicians tend to focus on the economic considerations when they lobby against specific bases being closed; however, political posturing also plays a significant role. Win-set analysis was used to provide a unique public choice perspective on how the power to close bases made such large shifts in short periods despite a measure of structure induced equilibrium. The win-set analysis answers the first research question posed in Chapter 1 of this work by providing an economic perspective for the actions of self-interested parties in the base closure process. When confronted by an exogenous force, the decline and eventual demise of the Soviet Union, Congress was forced to relinquish power to independent commissions in order to provide for a measure of base closures. The independent commission process, however, provided a means for individual Congressman to veraciously fight against base closures and protect their self-interests (political power in terms of committee assignments and defense campaign contributions and the economic impact to local communities) despite knowing that numerous bases would be closed. The hypothesis that self-interested forces were at work is confirmed by rapid shifts in the power to close bases, movements that cannot be adequately explained by the erosion of rents over time.

Individual BRAC closure rounds were explained to indicate that learning likely occurred over time. The commission, for numerous reasons, did not modify the first round of closures recommended by the DoD; however, other rounds did see slight to

modest modifications. Later rounds occurred over longer periods allowing the effects of rent seeking and special interests to be more fully realized. The DoD appears to be satisfied with BRAC outcomes as it continues to ask for further closures; however, Congress was reluctant for many years to grant additional authority due mainly to political reasons. It was shown that a major external force like the end of the Cold War or the threat of large-scale terrorism provides a motivating factor to relinquish power because these events modify the course of legislator's self-interests. The next chapter sets the foundation for the empirical model that is tested in chapter five.

Chapter 4. Theoretical and Empirical Methodology

> "Base closure is not a scientific process, it is an art in which politics, money, service rivalry, and the subjective interests of the individuals making the decision are all factors."[43]
>
> Admiral Eugene Carroll (Ret)

Chapter Overview

Like other specialty disciplines in economics, defense economics combines the tools of theoretical analysis and empirical economic analysis (Sandler, 1995:10). It is commonly recognized that significant efficiencies and important insights can be identified in the provision of national defense when quantitative approaches are used to test theoretical postulates. Previous chapters have outlined public choice theory to provide the foundation for analyzing BRAC from a political economy perspective. This chapter provides the theoretical underpinnings of the model and presents the basic empirical approach for the quantitative methods used to test two of the research questions and hypothesis. Building on this foundation, the next chapter will test the theoretical framework using econometrics to quantify underlying relationships. A major objective of this research is to test the developed theory with quantitative methods, not to develop a theory based on possible quantitative relationships.

[43] American Defense Policy, seventh edition, p. 240.

Developing a Testable Theory

Science was understood by medieval philosophers as demonstrable knowledge that compelled assent. The goal of scientists working in this environment was the discovery of "truths" that they defined as principles of universal application. The underlying goal was a search for the essential nature of things and for connections between things (Prasch, 1996, p. 1108). This medieval mode of thinking was influential on early political economists. Jean Baptiste Say's *Treatise on Political Economy* written in 1821 emphasizes searching for "general facts," "first principles," and "causation." In Say's own words, "There is not an absurd theory or an extravagant opinion that has not been supported by an appeal to facts" (Say, 1821, xx-xxi). Say implicitly indicates that economic, political, or societal positions can be advocated by gathering the "right" kind of data and analyzing and presenting it in the "right" way.

Too often in economic and statistical analysis researchers use "data mining" to squeeze theory out of data versus developing theory and then testing with appropriate methods.[44] Every economist, at some point in their training, has encountered varied methodological views and approaches to economic inquiry. Some of these approaches are well known such as Milton Friedman's methodology of instrumentalism in "The Methodology of Positive Economics" (Blaug, 1986, p. 265). Other methodologies, such as the Austrian view on methodological individualism are less well known (Mises, 1949,

[44] The term "data mining" refers to the practice of statistically evaluating a set of data to find perceived causal relationships and goodness of fit measures (high R^2) before formulating an appropriate theory. Data miners look to formulate theory based on data versus the proper approach of letting the theory dictate what data should be collected and analyzed.

p. 41). The difference between methodologies is striking, leading to wide-ranging policies that have real effects on prosperity and growth.

A fundamental difference in the varied economic methodologies is grounded in the way "truths" are uncovered and applied. Friedman takes the position that theories and methods are merely instruments for making predictions about phenomena in the natural and social realms. Any attempt to interpret them as more than vehicles of prediction is considered naïve and bad science (Blaug, 1986, p. 265). In contrast, the Austrian view of methodology relies upon apodictic certainty as a defining characteristic of good economic science. All "truths" are *a priori* true; the only relevant question is whether they apply to the situation being studied (Mises, 1949, p. 38-41).

Quantitative analysis needs to be based on foundations that are deeper than mere surface phenomena. An appeal to sound methodology prior to empirical investigation is essential to any empirical study. Nassau Senior argued in 1836 that political economy should be studied by first understanding, acknowledging, and accepting a few "general facts" or premises. Senior is consistent with the Common Sense approach to psychology when he advocates that "general facts" come from introspection rather than from extensive experimentation. Quoting Senior:

> ...premises consists of a very few general propositions, the result of observation, or consciousness, and scarcely requiring proof, or even formal statement, which almost every man, as soon as he hears them, admits as familiar to his thoughts, or at least as included in his previous knowledge;...(Senior, 1836, p. 2-3).

Senior proposed four "general facts" as premises. The first, and most important for this research, is that people are self-interested (Senior, 1836, p 26-87) - chapters two and

three of this work spent significant effort developing this important foundation. Richard Whately held similar introspection beliefs. "...the facts on which the general principles of the science are founded, come within the range of every one's experience" (Whately, 1832, p. 228). Whately, like Senior and Thomas Reid advocated invoking our common experiences to establish first principles of political economy (Prasch, 1996, p. 1119). As "quasi-rationalists," Whately and Senior believed their short list of first principles were the solid foundation required for political economy to embrace empirical science. Armed with their firm foundation, Whately and Senior believed their method was fully compatible with the empirics advocated by Newton and Bacon (Prasch, 1996, p. 1120).

Statistical manipulation in the form of regression equations has been used to assign measure to almost everything. Economists turned to statistical measurements because the method of experimentation found in the natural sciences was not a viable option. Economists did not have the luxury of being able to run controlled experiments where one variable can be isolated, manipulated, and observed. The most natural way to introduce the empirical method into the profession was to use statistical analysis on aggregate data. The approach of developing a theory based on first principles and then applying regression analysis is embraced in this work. This "uncontrolled" approach does lead to a significant limitation – the availability of data.

A major limitation in testing any theoretical postulate is the availability of enough quality data to provide credible statistical results. Lack of data is the main limiting factor in testing many theoretical models. Many of the theoretical concepts needed to develop the public choice model have been presented in earlier chapters. The model is one that

will be based on the self-interested aspects of political actors, special interests, logrolling, and principal agent problems that arise when bureaus and Congress are seeking to implement military base closure policy but have competing interests. As in all statistical models, the only definite statement that can be pronounced is that the model will not be completely specified. When developing quantitative models, the best one can hope for is that the model includes available, appropriate, and independent variables that adequately account for the variation in the dependent variable in a manner that is consistent with both theoretically sound relationships and observed occurrences. By relying on a theoretical model to dictate the data collection and analysis, it is expected that the model will be useful and that viable answers to the research objectives will be obtained.

Theoretical Model

In order to develop the theoretical model, mission, economic, and political forces that likely influenced the decision to close particular military bases during BRAC are considered. Past research, relevant literature, anecdotal evidence, and clear and careful thought were all used to identify logical independent variables that should be included in the regression analysis. The models rely on the self interested nature of human actors as detailed in previous chapters and advocated by public choice economics. The only limitation in selecting independent variables was the availability of public domain data.

The theoretical model follows traditional approaches to statistical modeling that encourages using the smallest number of independent variables that adequately explain the item of interest. This approach has a higher probability of developing a model that is numerically stable and is more easily generalized. Using this theoretical approach, three

groups of variables (military value, economic, and political) that effect the decision to close military facilities were considered. According to the DoD, military value was the most important variables they considered when proposing facilities for closure.[45] The following three sections describe the theoretical underpinnings for including each category of variable and describe the variables and their theoretical sign.

Military Value Variables

Military value variables include how many bases perform a specific mission such as strategic, general purpose, support, training, medical, and whether the mission is decreasing in scope. In the mid to late 1980's and early 1990's it was obvious that bases associated with strategic missions were decreasing due to the demise of the Soviet Union. Mission variables associated with a decreasing mission should be significant because the Pentagon claims to have made this variable their primary focus; however, the drawdown in military personnel that was occurring at the same time makes it difficult to classify whether some missions were actually decreasing or whether fewer personnel were accomplishing the same mission. For instance, the mission of general and support forces was not decreasing; however, the number of personnel assigned was decreasing due to the decrease in strategic forces and overall decreases in personnel levels.

The motivation to close bases with decreasing missions is relatively obvious. These bases provide little towards the goal of meeting national military objectives and therefore are a draw on the monetary base of the Pentagon. For economic reasons, the Pentagon

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[45] Source: Office of the Secretary of Defense. *The Report of the Department of Defense on Base Realignment and Closure.* Washington D.C.: April 1998.

wants to be able to close bases that no longer provide efficient contributions. Money freed from these locations becomes available for new weapon's systems (which the Pentagon has historically had a voracious appetite for), pay raises, and quality of life projects like new on-base housing, better on-base shopping and new recreation facilities. The following lists the two mission variables that are included in this analysis and the theoretical sign of their coefficients.

- **Number of Bases with Similar Mission** – this continuous variable captures the number of bases across the United States that the Pentagon has identified as performing a similar mission or category of missions. For instance, all support bases have the same mission code. Theory dictates that if there are a large number of bases that can perform the same mission, it is likely that some of those bases will be closed during BRAC. Conversely, if only a few bases can perform a mission (i.e. chemical weapons disposal), those bases will likely not be targeted for reduction. Under this theoretical approach, this variable should be positive – indicating that as the number of bases within a category increases there is a greater probability of closure

- **Mission Variable Direction** – this dummy variable reflects whether the primary mission of the base was decreasing. If a bases mission was decreasing it is hypothesized that the base would have a greater chance of being selected for closure, leading to a positive sign in the quantitative model

Previous quantitative work (Bielling, 1996) has included a variable to account for mission direction; however, past work has not included the number of bases in a particular mission category.

Economic Variables

The inclusion of economic variables in the model is rational - behind mission criteria it was the second criteria the DoD focused on when selecting bases for closure. Additionally, Congressman and local communities are understandably concerned about local economic impacts. Ideally economic variables would include size of the base, number of personnel assigned, economic impact to the local community, number of bases in the state, cost to close, and annual savings from closing. With the exception of the last two variables listed, each of these will be included in the model. The last two variables would provide a convenient way to check that the bases selected were those that were the least efficient in terms of accomplishing their mission; however, the cost to close and annual savings from closure are not available for bases that remained open. Additionally, projected savings for the bases that did close are not reliable or repeatable due to varying assumptions used and self-interested motivations of the Pentagon to skew figures in order to justify favorable outcomes.

From an introspective point of view, it makes sense for the DoD to close bases that are economically inefficient. A good example is the Air Force's northern tier strategic bombing bases. Prior to the end of the cold war, it was rational to place long-range bomber bases on the northern fringe of the U.S. so that bombers would have shorter distances to fly to the U.S.S.R. These bases were very expensive to maintain because

they were located in such places as Maine, and North Dakota where large amounts of annual snowfall lead to enormous costs to keep alert aircraft ready to fly and runways clear of ice and snow. Additionally, the severe weather lead to large operation and maintenance costs as aircraft, support equipment, and runways required constant maintenance due to the harsh environment. With the end of the cold war, southern bases were seen as more efficient because they were cheaper to maintain, and northern bases were closed to free crucial resources.

The five economic variables included in this work and their theoretical sign include:

- **Acreage** – this continuous variable accounts for the physical size of the base. It is predicted that the sign of the acreage variable will be negative, indicating that the larger a base, the less likely it will be closed. This reasoning follows the logic of economies of scale and the DoD's goal of keeping facilities that can adequately handle consolidations and changing future missions

- **Total DoD Personnel Assigned -** this continuous variable accounts for the number of government personnel assigned to a base. It is hypothesized that the sign of this variable will be negative, indicating that bases with larger numbers of personnel are less likely to be closed. This reasoning is based on economies of scale, economic impacts, and logrolling by legislators to protect large bases and their local economic effects

- **Number of Major Bases in the State** - this continuous variable accounts for the number of military bases that are located within a states geographic

boundaries. It is hypothesized that the sign of this variable will be positive, indicating that a state with a larger number of bases will be subject to a larger number of closures. This result occurs because a state with a large number of facilities can more easily absorb the short term economic impact of closing bases. Also, from a "fairness" perspective, an argument can be made that states with a large number of bases should loose more bases than states with only a few bases

- **Per Capita Defense Spending** – this continuous variable accounts for the per person defense spending in the state where the base is located. It provides a proxy for the economic impact to local and state economies when a base is closed or remains open. It is hypothesized that this variable will be negative, indicating that bases in states with large economic impacts will have less of a chance of being closed

- **Service Variables** – these dummy variables account for any differences in the probability of closure by the individual services. It is difficult to hypothesize the direction of these variables because different services approached the closure process with different goals and objectives. For example, the Army tends to desire large bases with room to maneuver heavy equipment, and space for helicopter operations. The Air Force is flexible in terms of location because of its inherent mission – flight operations – and does not require very large bases as long as practice/bombing ranges are within acceptable

distances. Finally, the Navy requires more coastal facilities and owns a variety of different size bases to meet its mission

Each of these economic variables has been included in some manner in the various BRAC studies that have been conducted over the past several years. Each has been found to be significant depending on the regression approach used and the goals of the research. It is hypothesized that several of the economic variables will be found to be significant in the model proposed in this work.

Political Variables

The second chapter of this work developed a convincing case for including political variables in the empirical analysis. These variables include the influence of special interests, logrolling effects, bureaucratic interactions, and principal-agent problems. Unquestionably political forces were effectively operating prior to BRAC because a stated purpose of the legislation forming independent commissions was to remove the political posturing that had frozen the ability of the U.S. government to close military infrastructure.

Because politicians want to provide for their own well being, the well being of constitutions, and the desires of special interests and rent-seekers who contribute to election and re-election bids, political forces will be important in the base closure process. The thirteen political variables included in this study seek to capture these effects and include the following:

- **State Delegation** – this continuous variable represents the total number of elected representatives from each state and is used as a proxy for the special

interests of the states elected representatives, as well as their ability to express preference intensities. It is logical to assume that this variable will have a negative sign, indicating that a base in a state with more representation in Congress is more likely to remain open than a base that is represented by fewer representatives

- **Membership on the Senate Armed Services Committee or a Senate Defense Appropriation subcommittee** – these dummy variables account for any special treatment or logrolling effects that may occur because a Senator on a defense related committee represents a base. As shown in chapter three, many of the bases deleted from the '91 - '95 closure lists were represented on a Senate defense committee. These variables should have a negative sign indicating that membership on a relevant committee decreases the probability of a base being selected for closure

- **Senate and House Majority** – these dummy measures indicates whether or not at least one Senator and the House member representing the base are in the majority party. It is logical to assume that the majority party will have a greater ability to influence decision making process then the minority party. The sign of these variables is postulated to be negative

- **Senate and House Seniority -** these dummy variables account for the greater logrolling influence that a senior member of Congress has over junior members. Crain and Tollison (1977) have found that seniority in

Congressional representation had a significant impact on the relative level of federal expenditures across state constituencies. It is hypothesized that these variables will have a negative sign, indicating that the more senior a member, the less likely a base will be closed

- **Membership on the House Armed Services Committee or a House Defense Appropriation subcommittee -** these dummy variables account for any logrolling effects that may occur because a base is specifically represented in the House of Representatives on a defense related committee. Following public choice theory, these variables should have a negative sign indicating that membership on a relevant committee decreases the probability of a base being selected for closure

- **Defense Contributions** – this continuous variable accounts for special interests that seek to influence the base closure process. As outlined in chapter two, special interests use rent-seeking to buy opportunities for federal revenue streams. Both local communities and firms engaged in defense related work are interested in the status of military bases that contribute to their economic prosperity. Public choice theory dictates that this variable will have a negative sign, indicating that larger defense contributions to elected officials will improve the chance that a particular base remains open

- **National Security Index (NSI) Score** – this continuous variable controls for the ideology of member of the House of Representatives. It gives an

indication of where defense expenditures fall in the utility function of each representative who has major bases in their district. Because the variable attempts to measure the support that representatives are willing to give the Pentagon, it is logical to assume that this variable will be negative. This indicates that the stronger the support of a representative for the Pentagon and military expenditures, the less likely will their base be identified for closure. If this variable is significant, it may also indicate that the Pentagon attempted to protect its strongest supporters from any adverse effects of a base closing

- **Commission Variable** – the commission variable considers the changes made by the commission to Pentagon recommendations for closure (see chapter 3). This variable is difficult to predict, because the commission added and deleted bases during the last three rounds; however, because the commission reviewed every closed base, it is hypothesized that this variable will have a positive sign. If significant, this variable will provide evidence that the commission was able to exercise control over the closure process and influence which bases eventually closed

- **Presidential Variable** – the presidential dummy variable attempts to control for the effects the President may have on the selection of bases for closure. It is hypothesized that those states who voted for the President in the previous election will more likely see their bases remain open because the President will want to reward them for their support and to ensure future support for himself and his party (i.e. Clinton in the 1993 BRAC round). This variable is

anticipated to be negative indicating that state support for the president leads to a lower probability of closure

Several of the political variables identified above have not previously been included in past regression associated with the BRAC process. Specifically, special interests variables like defense contributions and state delegations influences have previously not been included. Including these variables provides a unique approach to capturing special interest forces that were likely at work during the BRAC process.

Not all variables are expected to be significant in the regression model; however, all will be included in the original regression equation because their inclusion is consistent with the theoretical model and "first principle" of self-interest as outlined throughout this work. The theoretical model allows for a starting point for the regression analysis. Modifications to this model, once initial results have been obtained, will only be made if the quantitative results can be justified by logical deduction. The final section of this chapter introduces the empirical approach that will be used on the data collected on almost 400 major bases in the U.S.

Empirical Approach

Regression methods have become an important component in describing the relationship between a response variable and explanatory variables. In this work, the response variable is discrete, taking on two values - in all models it will be a yes or no response to the question, was the base closed by the BRAC process? A zero indicates the base remained open (a no answer) and a one indicates that the base was closed (a yes answer). The statistical package Stata will be used to conduct the econometric analysis.

Data were gathered for nearly all major military installations involved in the BRAC rounds.[46] As previously mentioned, major bases are defined as those that employed more than 300 government personnel. Major bases that are outside of the continental U.S. will not be included because they do not directly impact any one congressman or senator in a significant manner and therefore will likely not contain the political effects being evaluated. A regression model will also be developed with only active duty bases – eliminating guard and reserve facilities. It is hypothesized that slightly more significant results in terms of the model and individual parameters will be found when only active duty bases are considered because these bases will likely have larger political and economic impacts. Larger impacts provide a motivating force for special interests and rent-seekers to protect their investments. Sensitivity analysis will also be developed by year of closure, branch of service, and Pentagon defined major bases. The sensitivity analysis is important because it isolates the effects of learning over time and individual service processes.

The most popular model for binary data is logistic regression, which is a generalized linear model (GLM) for a binomial random component (Agresti, 1996, p. 103). The logistic model is similar to the classical linear regression model of the form:

(Eq 12) $$Y = \alpha + B_1 X_1 + B_2 X_2 + ... + B_K X_K$$

where:

Y is the dependent variable

[46] Six major base observations are missing due to either lack of data or lack of quality data that could be verified. Major bases closed but no included in this study are listed in Chapter 5.

α is the intercept

B_K are regression coefficients, and

X_K are the predictors

Despite the mathematical similarities, several differences exist. First, in the linear regression model the dependent variable is continuous and assumed to be normally distributed; while in the logistic model, the dependent variable is dichotomous and the probability distribution is binomial. Second, the logistic regression does not model the mean of Y directly. In the logistic model, the mean is:

(Eq 13) $$\pi(x) = \frac{e^{\alpha + B_1 X_1 \ldots B_K X_K}}{1 + e^{\alpha + B_1 X_1 \ldots B_K X_K}}$$

and it is modeled by a transformed logit link which is defined as:

(Eq 14) $$g(x) = \ln\left(\frac{\pi(x)}{1 - \pi(x)}\right)$$

The logistic model focuses on how the natural log of the odds that Y = 1 (a military base is closed) varies as a function of the linear predictors (Eq 12). The logit transformation is important because it allows *g(x)* to have many of the desirable properties of a linear regression model (Hosmer and Lemeshow, 2000, p. 6). The logistic model will use maximum likelihood (ML) estimation which yields values for the unknown parameters which maximize the probability of obtaining the observed set of data. ML estimates the values of the parameters that have the greatest likelihood of generating the observed sample of data if the assumptions of the model are true. The

approach calculates how likely it is that we would observe the data if a given set of parameters estimates were the true parameters.[47]

The model in this work will be a multiple logistic regression because there will be multiple independent variables which are measured on different scales. Additionally, robust standard errors, also known as Huber/White standard errors will be used to account for any misspecification of the model or violations of the assumptions. For example, if the correct model is a binary logit model and a binary probit model is used, the model has been misspecified. If the model is misspecified in this way, the standard errors will be incorrect. Arminger (1995) makes a strong argument for using robust errors because most researchers misspecify the model in some, albeit minor, manner. There are two model choices for binary outcome models using logistic regression – a binary logit or a binary probit model. The probit model is based on a normal distribution for the dependent variable, while the logit model is based on a distribution that is similar to the normal except in the tails which are considerably heavier.[48]

Transformations and Interaction Effects

The simplest way to include independent parameters in regression models is to assume that the parameters are linear with respect to the dependent variable. While this approach is convenient, it does not always pass theoretical scrutiny. Continuous variables in the regression model should be scaled to correctly reflect the effects the covariates have on the log-odds of the logit parameter. Each continuous variable will be

[47] Note: Long (1997) indicates that it is risky to use ML with samples smaller than 100.
[48] It resembles a *t* distribution with seven degrees of freedom. The data used in this analysis most closely resembles a logistic distribution rather than a normal distribution; therefore, the logit model will be used.

scrutinized and transformed where appropriate. The most likely transformation will be to take the natural log of independent variables when observation and theoretical reasoning dictates that a variables effect on the dependent variable changes with an increase in the independent variable. For example, it was postulated in the last chapter that an increase in the acreage of the base would lead to less of a chance for the base to be selected for closure (negative sign). The probability of closure may be linear or it may be decreasing at a decreasing rate. If the first scenario is expected, the variable would not be transformed. If it is suspected that a non-linear relationship holds, the independent variable would be transformed before including it in the regression model.

Once the main effects model has been specified, interaction effects within the model will be evaluated. The inclusion of interactions implies that the effect of one variable is not constant over the levels of other variables. Only interaction effects that can be theoretically supported will be included. Interaction effects in logistic regression analysis are most commonly modeled as a product of the main effect variables – just as is done in linear regression analysis. Interaction effects can be tested using a likelihood ratio test and will only be included if they are statistically significant at the 0.10 level or greater. A problem with including interaction effects in logistic regression analysis is the difficulty of interpreting the resulting coefficients (Jaccard, 2001). For this reason and for purposes of keeping the model as simple and broad as possible, interaction effects will only be included when sound relationships can be identified and supported by both mathematical and theoretical reasoning.

Measures of Fit and Post Regression Tests

Many scalar measures have been developed to help evaluate the measure of fit for categorical models. These scalar measures are primarily used to compare one model to another when deciding on a final model. In this regard, measures of fit only provide a rough guide in logistic regressions of whether a model is adequate. Long and Freese state:

> ..there is no convincing evidence that selecting a model that maximizes the value of a given measure results in a model that is optimal in any sense other than the model having a larger (or, in some instances, smaller) value of that measure. While measures of fit provide some information, it is only partial information that must be assessed within the context of the theory motivating the analysis, past research, and the estimated parameters of the model being considered (Long and Freese, 2001, p.80)

Measures of fit (R^2) in logistic regression analysis should not be compared to R^2 measures obtained under linear regression approaches because low R^2 values are the norm in logistic regression analysis. Fear that misinterpretations and inadequate comparisons will occur, leads many scholars to not report R^2 results (Hosmer and Lemeshow, 2000, p. 167). In this work, R^2 values are reported to demonstrate that the basic model is improved by a further stratification of the data to specific service, and year components.

The best way to ensure a logistic model provides a good measure of fit is to conduct post-regression analysis. For example, logistic coefficients that are estimated by ML can be tested with a Wald test and/or a likelihood-ratio (LR) test. Both tests evaluate the null hypothesis (H_0) that there is some constraint on the model's parameters. These tests can be used to test whether all or a sub-set of the estimated coefficients are simultaneously

equal to zero or if two or more estimated parameters are statistically no different from one another. Long and Freese (2001) provide a detailed approach to conduct post regression analysis using Stata. Their suggested process is followed after each model to ensure that proper specification and appropriate measures of fit are conducted.

Summary

This chapter sets forth a theoretical model of closures that is based on the application of economic principles to the political decision making process. It is hypothesized that the services based their closing decision on mission requirements, economic criteria, and political criteria. A theoretical sign was postulated for each of the independent variables within these three categories. The BRAC commission evaluated the recommendations of the Pentagon and made adjustments that were also based on these categories. The objective of the theoretical model is to account for mission, economic and political effects and lay a theoretical foundation for each of the independent variables.

The empirical model will use the theoretical variables in a logistic regression framework to quantify the effects of the variables. A brief introduction to logit regression techniques was provided with specific emphasis given to how logistic regression analysis differs from linear regression analysis. Of specific interest, was the discussion on the measures of fit for logistic regression results and post estimation tests that will be conducted on each model to determine applicability.

Chapter 5. Quantitative Analysis of Base Closures

> "...politics is a part of the American experience, and while the name may have a negative connotation among a majority of American citizens, it is not easy to replace political input, bargaining, and, in some cases, under-handedness with the cold calculations of the commission process. In that sense, the fact that BRAC allowed politics to intervene in the base-closure process is, in the end, perhaps a fitting testimony to the success of the BRAC process." [49]
>
> David S. Sorenson

Chapter Overview

The work in this chapter applies econometric regressions analysis to the BRAC closures process by isolating economic, mission, and political variables that are relevant for considering the probability a military facility is selected for closure. The unique quantitative approach extends past BRAC analysis by looking at the closure process from a political economy perspective. Two models are evaluated – one containing bases with more than 300 personnel including active duty, National Guard, and Reserves; and one containing only active duty bases with more than 300 personnel. In both approaches an economic/mission model is first considered and then compared to a model that adds political variables.

[49] Shutting Down the Cold War, 1998, p. 243.

The Data

The data for this analysis were gathered from numerous sources, including: publications by the DoD, OMB, GAO, Congressional Quarterly, Census Bureau, and BRAC commission reports. All of the data were unclassified and can be found in the public domain. Limiting data collection efforts to public domain information means that proprietary models, data developed by private companies, and Pentagon models that are considered sensitive or confidential, especially post September 11th 2001, were not included in the database. One limitation of the economic data is the lack of an estimate of the cost to close a base and an estimate of annual savings once a base is closed. The cost of base realignment and closure (COBRA) model was used by the DoD to estimate the costs savings of closed installations. While top-line COBRA estimates exist in various documents for the bases that were closed, the raw data that were used to populate the model have been lost by the DoD. The missing data are cited by the GAO as one of the major problems it faces in confirming that closing a particular base was economically efficient. Additionally, costs to close data are not publicly available for bases that remained open.

The unit of analysis in this work is the military base. Every attempt has been made to relate relevant variables to a particular facility to determine the effect on the probability a specific base will close. The facilities in the study are limited to major bases located in the United States - foreign bases were not considered. Additionally, all facilities associated with the Army Corps of Engineers are excluded from consideration because legislation passed in 1991 retroactively removed corps facilities from the BRAC

process. Minor bases were excluded because it is hypothesized that elected representatives will spend little time and effort lobbying to keep open an unmanned radar site or a facility that only employs a few dozen people. The cost of keeping these facilities open in terms of future logrolling commitments is prohibitively high. Also, the closure of a minor facility would have little local economic impact and therefore little influence on the ability of a representative to mount a successful reelection campaign or secure needed campaign contributions. The primary database includes 394 active duty and guard/reserve bases from 1988 (Appendix 1). Summing the number of open bases for each of the closure years leads to 1456 observations. Twenty-one variables were collected for each observation, leading to more than 30,500 data items in the database. Table 6 lists the number of observations by BRAC closure year for the primary database.[50]

Table 6. Observations by Year of Closure – Model 1

Year	Number of Observations Closed	Number of Observations Remaining Open	Total Observations
1988	15	379	394
1991	26	357	383
1993	28	328	356
1995	25	298	323
Total	**94**	**1,362**	**1,456**

[50] The database includes five major realignments not identified in most BRAC reports as closures but which met the criteria used in this study. They are: Pueblo Depot Activity, CO (1988), March AFB, CA (1991); Griffis AFB, NY (1991); Naval Station Charleston, SC (1991); and NAS Memphis, TN (1991).

The database is cross-sectional due to the inclusion of facilities located throughout the U.S. – all 50 states and 201 House districts are represented. The data are generally time-series in nature due to the four distinct time frames included in the database, but every observation is not included in each time segment. Bases closed in 1988 are not included in future rounds; however, if a base had only 280 employees in 1988 but because of closures and realignments had more than 300 employees in 1991 it was added to the 1991 observation list. There were also some smaller bases that, while not closed, dropped from the database in later years because the number of employees fell below 300 despite the base remaining open. It was problematic from a data collection perspective to keep bases falling below 300 personnel because the DoD does not keep good public sources of information for small facilities across the variables of interest. In most cases a drop in personnel was attributable to the drawdown in forces that was simultaneously occurring alongside BRAC. Due to these constraints, the database is not a true time-series, but it does closely approximate one.

Table 7. Observations by Year of Closure – Model 2

Year	Number of Observations Closed	Number of Observations Remaining Open	Total Observations
1988	15	321	336
1991	24	291	315
1993	25	263	288
1995	21	236	257
Total	**85**	**1,111**	**1,196**

Table 7 lists the observations from the second model – only active duty bases. This model is more tractable from a data collection perspective because the Pentagon does a better job tracking information on active duty bases then on Guard and Reserve bases. There was still an occasional base that fell from the database or was added to the database due to fluctuations above or below 300 personnel.

Six major bases that were closed are not included in the database. These observations were not included because verifiable data could not be obtained for one or more of the closure rounds. The missing observations include: Naval Station Lake Charles, LA, and Naval Station Galveston, TX, from the 1988 round; Hunters Point Annex, CA, from the 1991 round; Naval Station Mobile, AL, from the 1993 round; and Ontario IAP Air Guard Station, CA, and Fort Holabird, MD, from the 1995 round. Most of these facilities were relatively small and it is likely that not including them will have little impact on the regression results.

Descriptions, Sources, and Limitations of Variables

Earlier chapters provided the theoretical underpinnings for each of the independent variables and postulated the directional effect that each variable would manifest in the regression model. A significant amount of detail on each variable is provided to ensure that the results presented in this work are repeatable and well documented. The sources of data, limitations, and unique characteristics of the independent variables include the following:

- **Acreage** – this variable is reported in thousands of acres in order to limit the size of the standard deviation which can lead to rounding problems in a logistic

regression model (Long and Freese, 2001, p. 65). The sources of data for this variable were primarily the DoD Base Structure Reports (BSR) for 1987, 1990, 1992 and 1993. The BSR was discontinued after 1993, so the 1994 report was unavailable for BRAC 1995. The variable is lagged by one year to reflect the acreage totals that would have been available to the Pentagon and the BRAC commission as they made their selections. A secondary source of information was Evinger's guide to military facilities – 1991 and 1995 editions. When acreage numbers varied between the two sources for the same facility, the official position found in the DoD Base Structure Report was used as the primary source. Most bases maintained a constant acreage during the years in the study; however, there were a number of bases where the acreage changed from year to year. These changes occurred for various reasons – the loss of leased facilities, the gain of a nearby function or mission, or the disposal of unneeded acreage

- **Total DoD Personnel Assigned**[51] – this variable is also reported in thousands and lagged by one year for the reasons mentioned above. The sources of data were various DoD Base Structure Reports and Evinger's Guide to Military facilities. Again the BSR was the primary data source. It was possible to break out the number of personnel assigned by military and civil servant, but those breakouts were not found to be significant in the regression models so only the

[51] The largest fluctuation in personnel occurred in the Navy. Because personnel figures for Navy bases include all military personnel assigned to ships which are homeported at the base, it is relatively easy for the Navy to adjust the number of personnel assigned to a facility by moving a ship to a different homeport.

total number of personnel assigned was used. The limitation of this variable is that it does not include contractor personnel employed at a base. For most bases, the number of permanent contractors is relatively small and would not have a significant effect on the dependent variable; however, at a few bases there are a significant number of contractor personnel and their termination will have a large impact on the local economy. An example is Arnold AFB, TN. Arnold is owned and run by the Pentagon; however, only 280 of its approx 3,000 employees are government personnel. Bases like Arnold were dropped from some years of the study because there is not a reliable source document which identifies, across all four closure rounds, the number of permanent contract personnel employed

- **Number of Major Bases in the State** – this variable includes all major bases with more than 300 personnel in the state where the base is located

- **Per-Capita Defense Spending** – this variable measures the amount of defense dollars spent in a state on a per-person basis and is measured in thousands of dollars. The source of the data was the Statistical Abstract of the U.S. for various years published by the U.S. Census Bureau. Defense spending includes military pay and defense contracts greater than $25,000. Defense dollars were divided by state population to arrive at a per-capita dollar amount. The exact population and defense dollars used in the regression analysis are found in Appendix 2

- **Service Variables** – following good regression building techniques, the number of dummy variables for the various services is N-1, for a total of two dummy variables – one for the Army and one for the Navy/Marines.[52] The Air Force is treated as the base case

- **State Delegation** – this variable changed in the middle of the data set because of congressional redistricting that occurred after the 1990 census. State delegation variables are therefore the same for the 1988 and 1991 rounds and then changed for the 1993 and 1995 rounds. The variable accounts for the level of Congressional representation, which reflects the ability of a state to use its special interest power to influence base selection outcomes. The size of the state delegation is equivalent to the number of electoral votes for each state (Appendix 3)

- **Senate Armed Services and Senate Defense Appropriations Committee** – these variables reflects membership on defense related committees by either senator of the state where a base is located. The source of the data is Congressional Quarterly's *Politics in America* for the 100th, 102nd, 103rd, and 104th Congresses. The 101st Congress was not included in the database because of the time frame that elapsed between the first and second BRAC closure rounds – three years vs. two years for all other rounds. The variable is coded

[52]For purposes of this work, the Marine Corps was combined with the Navy because the Corps falls under the Navy for funding and major decisions and because the number of Marine Corps bases was to small to be of consequence in the logistic model when considered separately.

one if the base is represented in the Senate and zero otherwise. This coding technique is used for all dummy variables – a one if the variable applies to the base and a zero otherwise

- **Senate Majority and Senate Seniority** – these variables reflect majority party representation (dummy variable) and years of service of the senior senator respectively. The source of data is Congressional Quarterly's *Politics in America*

- **House Armed Services and House Defense Appropriations Committee** – these variables reflects membership on defense related committees or subcommittees by the house representative of the district where the base is located. In a few cases, a base crossed House district lines leading to a subjective determination about which district to use. Detailed maps of Congressional districts and military bases were used along with the published zip code of the base. If the published zip code aligned with only one district, that district was used. If a base crossed districts, the district where the majority of the base property was located was used. Every attempt was made to locate the main entrance to the base and use it as the primary location for determining which House district to use. The source of the data is Congressional Quarterly's *Politics in America*

- **House Majority and House Seniority** – these variables reflect majority party representation (dummy variable) and the years of service of the House

representative respectively. The source of data is Congressional Quarterly's *Politics in America*

- **Defense Contributions** – this variable represents the dollar value of defense related campaign contributions that the House representative for the base received in the previous election cycle (two years). The variable is reported in thousands of dollars to limit the magnitude of the standard errors. By lagging the contribution data, the variable allows for special interests to have an effect as representatives seek to compensate those who helped them with their election bids. The source of data was *Open Secrets: The Encyclopedia of Congressional Money and Politics* published by the Center for Responsive Politics in 1988, 1990, 1992, and 1994. This variable has one minor limitation – for contribution amounts that were less than approximately $1,000, the *Open Secrets* publication often provided a graph of defense contributions rather than list the actual dollar value. In a few cases, it was difficult to tell if the dollar amount was $250, $500, $750 or some figure in between because the scale of the graph was often in $10,000 units to account for larger contributions from labor or corporate sources. This limitation is not significant and is only noted to provide a full accounting of all limitations and restrictions that were encountered when building the database

- **National Security Index (NSI) score** – this variable is published every two years by the American Security Council (ASC). The NSI score rates members of Congress on their support of defense policy issues over a two year period

based on their voting record on defense related matters. The source for this variable was bi-annual ('88, '90, '92, '94, and '96) publications of *The Almanac of American Politics* published by National Journal Inc. The variable is lagged by two years to represent the NSI score that was available to the Pentagon, President, and BRAC commission when closure recommendations were formulated. For instance, the 1988 publication reports the 1986 NSI score for members of Congress. Freshman House representative do not have a lagged variable because one was not available so the current NSI score was used. For example, the 1988 NSI score (published in 1990) was used for freshman congressman in the 100th congress, while the 1986 score was used for all other representatives of the 100th Congress. The number of freshman representatives in the base study is small (29 out of 201 in 1988). The largest limitation for this variable occurred in 1995. The last year NSI scores were developed was for the 103rd congress and the scores were published during the 104th congress – the last congress used for this study. For veteran congressman, the final NSI score was the appropriate choice for the last closure round; however, freshman representatives did not have an NSI score. A proxy was used for the freshman in the 104th congress – the proxy was the Center for Security Policy's (CSP) scorecard. The CSP scorecard is computed in the same manner as the NSI score – how representatives vote on defense related issues. The scale for the two measures is also the same, 0 to 100. Several NSI scores were checked with CSP scores for overlapping years and it was found that the two measures provide a

close approximation of one another. The CSP score could not be used for all years of closure because the first year it was published was 1990. The number of freshman in the 104th Congress where a CSP figure was used as a proxy was 38 out of 181 total representatives

- **Commission Variable** – this variable accounts for the effects of the commission on the base closure process. The variable is a dummy variable that is coded one if the commission changed a DoD recommendation by adding or deleting a base. The data for this variable were culled from the four official commission reports that were submitted at the end of each closure round to Congress

- **Presidential Variable** – this variable is coded one if the state voted for the sitting president, zero otherwise. The source of data was the Federal Election Committee web page. The database uses President George H.W. Bush for the first two closure rounds and President William J. Clinton for the last two rounds

- **Bases with Similar Missions** – this variable represent the number of bases that the DoD identified as having a specific mission category. The sources of data for this variable were various base structure reports. Table 8 lists the different mission categories and the number of bases in each category for each closure year

Table 8. Base Breakout by Mission Description and Year

Mission Description	Number of Bases -1988	Number of Bases -1991	Number of Bases -1993	Number of Bases -1995
Strategic Forces/Strategic	28	23	17	13
Strategic Forces/Intel and Comm	1	1	1	1
Strategic Forces/Guard and Reserve	10	8	6	5
Strategic Forces/Research and Development	1	1	1	1
General Purpose Forces/General Purpose	63	67	60	52
General Purpose Forces/Airlift/Sealift Forces	14	12	12	13
General Purpose Forces/Guard and Reserve	48	60	62	61
Aux Forces/Intel and Comm	14	14	12	10
Aux Forces/Research and Development	33	31	31	30
Aux Forces/Central Supply and Maint	2	2	2	2
Mission Support Forces/Strategic	2	2	2	2
Mission Support Forces/General Purpose	35	32	27	24
Central Support Forces/Central Supply and Maint	65	60	60	52
Central Support Forces/Training, Medical and Other	78	70	63	57
Total	**394**	**383**	**356**	**323**

- **Mission Variable Direction** – this variable accounts for the declining missions of various categories of bases. As Table 8 demonstrates, the mission of the strategic forces was declining over the closure process; however, Table 8 should not be used to categorize the mission direction of all categories. Various BRAC reports and Pentagon publication give a better indication of which mission categories were decreasing due to mission changes and which were merely scaling back due to personnel cuts

These twenty-one variables are not the only variables that could have been included in the type of analysis conducted in this work; however, they do provide a good theoretical base for testing and evaluating the research questions. As previously indicated, some variables that would be appropriate to include cannot be included due to

lack of data. Additionally, one of the goals was to keep the number of variables to a manageable level so that results could be realistically presented and interpreted.

Models and Results

The initial model includes all military facilities with more than 300 government employees. Congress has historically focused on facilities with greater than 300 employees, the BRAC commission focused on this level, and closures of this size typically require major unit consolidations, significant cleanup costs, and disposal of large amounts of infrastructure. The second model uses the same employment restrictions but eliminates all bases that are specifically associated with Guard and Reserve activities. Using public choice reasoning, it is believed that politicians may have paid little attention to Guard and Reserve facilities because they tend to represent a much smaller portion of DoD appropriation authority and they are tightly intertwined with local state politics and Governor control and call-up. For these reasons, the marginal benefits of protecting many of these facilities likely falls below the associated marginal costs. By considering these two models, it is believed that a good deal of the political and economic variables can be captured and analyzed in a way that will provide insight into the politics of base closures.

In a linear regression model, most of the work of interpretation of results is straightforward once the model and individual estimates have been obtained.[53] In a logit regression, a substantial amount of additional computation is necessary after the original

[53] For example, a unit increase in and independent variable (x) is expected to increase the dependent variable (y) by B when all other variables are held constant.

estimates have been computed. Many of these calculation are difficult and prone to error; however, routines have been computed for Stata that allow these computations to be accomplished in a reasonable amount of time with great accuracy (Long and Freese, 2001, p. 1). These routines will be utilized and the methods proposed by Long and Freese will be followed for each model to provide robust statistical tests of the overall model and individual parameter estimates.

Model 1

For model 1, all figures and tables will be included in the text to assist in understanding the full analysis. Output for model 2 and the sensitivity analysis can largely be found in the Appendices. Table 9 lists the summary statistics for each of the independent variables used in the model 1 database. The summary statistics indicate that the type and size of bases spans the full ranges of military facilities. Bases as small as one acre and 300 personnel are included to bases with more than 4.5 million acres and 65,000 personnel. The number of major bases in a state also varied greatly – from one to 62. Almost half of the major bases were represented on the Senate Armed Services Committee and about one-third were represented on the House Armed Services Committee. There was a large disparity concerning the amount of defense contributions to House members representing large bases – from zero to $162,000, with $16,000 being the mean. Finally, it was interesting to note the number of bases that performed a similar mission – as many as 78 were classified by the Pentagon as performing the same or similar function.

Table 9. Summary Statistics – Model 1

Independent Variable	Obs	Mean	Std. Dev.	Min	Max
Acreage (1,000)	1456	43.49332	224.4173	0.001	4545.214
Total DoD Personnel (1,000)	1456	5.85535	7.645655	0.3	65.336
Major Bases in State	1456	17.95124	17.41381	1	62
Per Capita Defense Spending (1,000)	1456	1.126795	0.6769	0.15	2.793
Army Variable	1456	0.2554945	0.4362887	0	1
Navy Variable	1456	0.3667582	0.4820853	0	1
State Delegation Size	1456	18.93201	15.40456	3	54
Senate Armed Services Cmt	1456	0.4457418	0.4972181	0	1
Senate Defense Subcmt	1456	0.3777473	0.4849905	0	1
Senate Majority	1456	1.133242	0.7237508	0	2
Senate Seniority	1456	15.96085	8.134554	1	41
House Armed Services Cmt	1456	0.3097527	0.4625505	0	1
House Defense Subcmt	1456	0.0570055	0.2319328	0	1
House Majority	1456	0.5576923	0.4968311	0	1
House Seniority	1456	9.870192	8.102542	1	44
Defense Contributions (1,000)	1456	15.93999	22.75435	0	162
National Security Index Score	1456	66.96085	36.36554	0	100
Commission Variable	1456	0.0178571	0.1324776	0	1
Presidential Variable	1456	0.7335165	0.4422719	0	1
Bases with Similar Mission	1456	49.00549	20.20751	1	78
Mission Variable	1456	0.2651099	0.4415434	0	1

The initial regression analysis of model 1 is limited to economic and mission variables while the second regression adds political variables. The objective is to determine if the initial model increases in explanatory power when political variables are added to the equation. The method of comparison is to look at the overall significance of the models and at the significance of individual independent variables. It is hypothesized that the political/economic/mission model will be more significant than the purely economic/mission model. Regressing economic and mission independent variables on the dependent variable *Closed*, provides the following results:

Table 10. Economic/Mission Version of Model 1

Logit estimates — **Number of obs = 1456**; **Wald chi2(8) = 31.01**; **Prob > chi2 = 0.0001**

Log likelihood = -329.87998 — **Pseudo R2 = 0.0534**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.019408	0.0069865	-2.78	0.005	-0.0331014	-0.0057147
Total DoD Personnel (1,000)	-0.0059231	0.0179109	-0.33	0.741	-0.0410278	0.0291817
Major Bases in State	0.0186832	0.0062021	3.01	0.003	0.0065272	0.0308392
Per Capita Def Spend (1,000)	-0.5656827	0.223254	-2.53	0.011	-1.003253	-0.1281129
Army Variable	0.7873685	0.2922348	2.69	0.007	0.2145988	1.360138
Navy Variable	0.2585439	0.2953257	0.88	0.381	-0.3202838	0.8373716
Bases with Similiar Mission	-0.004321	0.0053806	-0.8	0.422	-0.0148669	0.0062248
Mission Variable	0.3161175	0.242033	1.31	0.192	-0.1582585	0.7904935
Constant	-2.372901	0.3443774	-6.89	0.000	-3.047868	-1.697934

The log likelihood corresponds to the value of the log likelihood at convergence and is computed by:

(Eq 15) $$L(B) = \ln[l(B)] = \sum_{i=1}^{n} \{y_i \ln[\pi(x_i)] + (1 - y_i)\ln[1 - \pi(x_i)]\}$$

The Wald chi2 value and associated p-value is the value of a likelihood-ratio chi-squared for the test of the null hypothesis that all of the coefficients associated with the independent variables are simultaneously equal to zero. For this model, the test statistics indicate that the model is overall statistically significant (reject the null hypothesis) and that independent coefficients are not simultaneously equal to zero. The Pseudo R^2 is a measure of fit also known as McFadden's R^2. In logistic regressions the R^2 value can be used to compare logistic models to see which model is more appropriate. The left column lists the variables in the model with the dependent variable listed at the top of the

column. The "Coef" column contains the ML estimates for the model. The "Robust Std. Err." column is the robust standard error for each of the coefficient estimates. The "z" and "P>z" columns are the ML estimate divided by the standard error and a two-tailed z-test respectively. The end points for the confidence interval for each ML estimate is found under the "95% Conf. Interval" column.

The percentage change in odds for each independent variable is computed in Stata by running the "listcoeff" command and specifying the output to be generated in percent format. The percent change in odds table provides the percent change in the odds a base is closed for a one unit increase and a one standard deviation increase in any continuous independent variable. For dummy variables, the odds table provides the increase or decrease in the odds of closure for variables coded one.

Table 11. Percent Change in Odds - Economic/Mission Model 1

logistic (N=1456): Percentage Change in Odds

Odds of: 1 vs 0

Closed	b	z	P>z	%	%StdX	SDofX
Acreage (1,000)	-0.01941	-2.778	0.005 *	-1.9	-98.7	224.4173
Total DoD Personnel (1,000)	-0.00592	-0.331	0.741	-0.6	-4.4	7.6457
Major Bases in State	0.01868	3.012	0.003 *	1.9	38.5	17.4138
Per Capita Def Spend (1,000)	-0.56568	-2.534	0.011 *	-43.2	-31.8	0.6765
Army Variable	0.78737	2.694	0.007 *	119.8	41	0.4363
Navy Variable	0.25854	0.875	0.381	29.5	13.3	0.4821
Bases with Similiar Mission	-0.00432	-0.803	0.422	-0.4	-8.4	20.2075
Mission Variable	0.31612	1.306	0.192 **	37.2	15	0.4415

b = raw coefficient
z = z-score for test of b=0
P>|z| = p-value for z-test
% = percent change in odds for unit increase in X
%StdX = percent change in odds for SD increase in X
SDofX = standard deviation of X

*Significant at 0.10 or better (two-tailed z-test)
**Significant at 0.10 or better (one-tailed z-test)

All independent variables are presented in Table 11, with statistically significant variables identified by asterisks. An example of the interpretation of the percent column is a one unit increase in the acreage of a base (1,000 acres) decrease the odds a base will be closed by 1.9%. Also, a base with a declining mission (coded one) will have a 37.2% increase in the odds of closure versus a base that does not have a declining mission.

The economic/mission version of model 1 as specified is significant and the signs of the independent variables match those anticipated by the theoretical model except for the number of "bases with similar mission." This variable is insignificant in the model so the sign is not too troubling. Although the sign is correct for the variable "number of personnel," the variable is statistically no different than zero. The navy variable is also not significant, indicating that the navy and air force base cases are not statistically different from one another. All other variables are significant at the 0.05 level or better.

From a theoretical perspective, it is possible that the acreage variable and the personnel variable are equal to one another, or in other words, they represent the same effect on base closures. A Wald[54] test performed on the null hypothesis that acreage is equal to total DoD personnel finds that these two parameter are likely equal to one another ($X^2 = 0.43$, df =1, p = 0.5126) and the null hypothesis cannot be rejected. The Wald test results help explain why the number of personnel is not significant in the model. However, because the number of personnel and acreage vary in such large degrees, it was theoretically not possible to exclude one of the variables.

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[54] Statistical theory is not clear on whether Wald or LR test are preferable in models for categorical outcomes (Long and Freese, 2001, p.112). The choice of which test to use is often a matter of convenience and personal preference.

Additional measures of fit, besides Pseudo R^2 are also calculated in order to make comparisons between models. Table 12 lists the other measures of fit.

Table 12. Goodness of Fit Measures - Economic/Mission Model 1

Goodness of Fit Measures			
McFadden's R^2:	0.053	McFadden's Adj R2:	0.028
Maximum Likelihood R^2:	0.025	Cragg & Uhler's R2:	0.066
McKelvey and Zavoina's R^2:	0.852		
Variance of y*:	22.271	Variance of error:	3.29

McFadden's R^2, also known as the "likelihood-ratio index", compares a model with just the intercept to a model with all the independent parameters. McFadden's R^2 is the Pseudo R^2 figure that is reported in Table 10. It is computed by:

(Eq 16)
$$R^2_{McF} = 1 - \frac{\ln \hat{L}(M_{Full})}{\ln \hat{L}(M_{Intercept})}$$

If the full model and the model with only the intercept are equal, the result is zero. Because McFadden's R^2 always increases as new variables are added, an adjusted version can be used where K* is the number of parameters.

(Eq 17)
$$Adj \quad R^2_{McF} = 1 - \frac{\ln \hat{L}(M_{Full}) - K^*}{\ln \hat{L}(M_{Intercept})}$$

Another measure of fit is the Maximum Likelihood R^2 which is analogous to R^2 in the linear regression model. This measure of fit was suggested by Maddala and is:

(Eq 18) $$R^2_{ML} = 1 - \left[\frac{L(M_{Intercept})}{l(M_{Full})} \right]^{2/N}$$

Cragg and Uhler suggest a normalized measure of the maximum likelihood R^2 which is defined as:

(Eq 19) $$R^2_{C\&U} = \frac{1 - \left[L(M_{Intercept}) / L(M_{Full}) \right]^{2/N}}{1 - L(M_{Intercept})^{2/N}}$$

Finally, McKelvey and Zavoina's R^2 is computed by defining the model in terms of a regression on a latent variable y* where $y^* = x\beta + \varepsilon$:

(Eq 20) $$R^2_{M\&Z} = \frac{\hat{Var}(\hat{y}^*)}{\hat{Var}(\hat{y}^*) + Var(\varepsilon)}$$

When comparing models, each of the R^2 measures can help provide a basis for comparison as well as assisting in determining the overall goodness of fit.

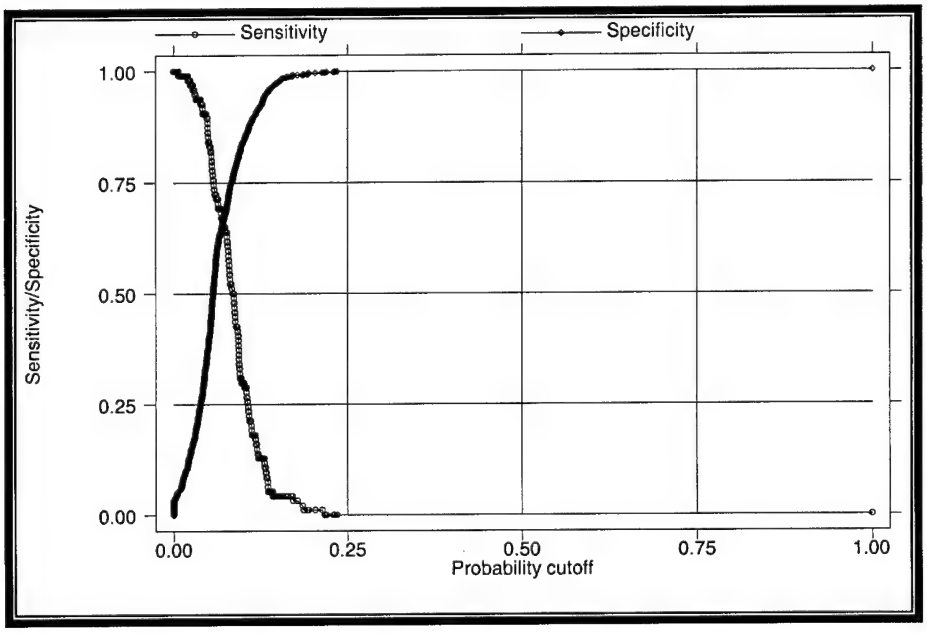

Figure 13. Cutoff Graph - Economic/Mission Version of Model 1

Post estimation tests indicate that the economic model correctly classified 62.6% of the observations for *Closed.* This result is based on a probability cutoff point of 0.065 which is the cutoff point that maximizes both the sensitivity and specificity of the model (Figure 13). Another post estimation test is to compute the area under the Receiver Operating Characteristic (ROC) curve.

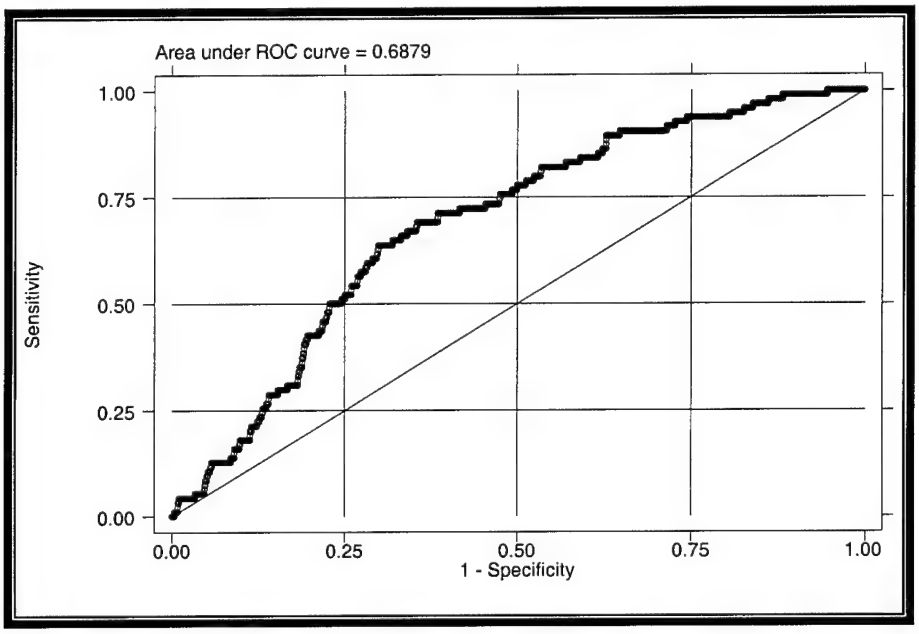

Figure 14. ROC Graph – Economic/Mission Version of Model 1

The area under the ROC curve, which ranges from zero to one, provides an indication of the models ability to discriminate between bases chosen for closure and bases not chosen for closure. It plots the sensitivity versus one minus the specificity for the entire range of cutpoints. As a general rule: if ROC = 0.50 there is no discrimination between the two events (close and not close) and the model is likely not very useful. If 0.7<= ROC < 0.8

there is acceptable discrimination. If 0.8<= ROC < 0.9 there is excellent discrimination and if ROC > 0.9, there is outstanding discrimination.[55] Figure 14 presents the ROC curve for the economic model and indicates that the model may not have an acceptable level of discrimination because the ROC value falls below 0.70.

A post estimation test was also conducted of the model's ability to predict the outcome of *Closed.* Stata's "predict" command can be used to compute predicted values for each observation in the current dataset because the logistic model allows an exploration of how each explanatory variable affects the probability of a base closing. The economic/mission version of the model was only able to predict probabilities of closure between the range of 0 and 0.235. This means that the highest probability an observation was assigned for closing was just over 23%. Overall, the economic/mission model is significant and does indicate as hypothesized that economic and mission variables were statistically significant when major bases were closed during BRAC; however, there is room for improvement as the model is not able to predict closure events with an acceptable level of discrimination or place a very high predicted probability of closure on any one observation.

The second version of model 1 is the full logistic model which adds political variables to the previous model. Results for this model are found in Table 13. The output indicates that the overall model is significant and that the model has a better fit than the economic/mission model (larger R^2 and larger Wald chi2). Also, several of the

[55] Hosmer and Lemeshow (2000) indicate that in practice it is extremely rare to observe areas under the ROC curve greater than 0.9. Additionally, they indicate that poorly fitting models may have good discrimination so it is important to look at both measures of fit and discrimination when evaluating a logistic model.

political variables are statistically significant. Using the same cutpoint as the economic version of the model indicates that the full model correctly specifies 63.67% of the observations which is an increase over the economic model. Additionally, the ROC curve for the full model is 0.7291 which indicates that the full model provides acceptable discrimination.

Table 13. Regression Results - Full Version of Model 1

Logit estimates — **Number of obs = 1456**
Wald chi2(21) = 58.39
Prob > chi2 = 0.0000
Log likelihood = -317.97089 — **Pseudo R2 = 0.0875**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0153107	0.0063084	-2.43	0.015	-0.027675	-0.0029463
Total DoD Personnel (1,000)	-0.0107506	0.0183535	-0.59	0.558	-0.0467228	0.0252215
Major Bases in State	0.0063089	0.0088384	0.71	0.475	-0.0110141	0.0236319
Per Capita Def Spend (1,000)	-0.1468435	0.2601837	-0.56	0.572	-0.6567942	0.3631071
Army Variable	0.6029744	0.3068299	1.97	0.049	0.0015989	1.20435
Navy Variable	0.22694	0.2891388	0.78	0.433	-0.3397616	0.7936416
State Delegation Size	-4.83367	2.484684	-1.95	0.052	-9.703561	0.0362206
Senate Armed Services Cmt	-0.1081179	0.2549266	-0.42	0.671	-0.6077648	0.391529
Senate Defense Subcmt	-0.0904422	0.2780203	-0.33	0.745	-0.6353519	0.4544676
Senate Majority	-0.0427355	0.1633741	-0.26	0.794	-0.3629428	0.2774719
Senate Seniority	-0.0058679	0.0175949	-0.33	0.739	-0.0403533	0.0286175
House Armed Services Cmt	0.1041571	0.3308638	0.31	0.753	-0.544324	0.7526381
House Defense Subcmt	-0.0194702	0.6276297	-0.03	0.975	-1.249602	1.210661
House Majority	-0.4057591	0.2585574	-1.57	0.117	-0.9125224	0.1010041
House Seniority	0.0096803	0.0127388	0.76	0.447	-0.0152873	0.034648
Defense Contributions (1,000)	-0.0146675	0.0085283	-1.72	0.085	-0.0313826	0.0020477
National Security Index Score	-0.0046037	0.0037824	-1.22	0.224	-0.0120171	0.0028098
Commission Variable	1.576798	0.4976611	3.17	0.002	0.6013997	2.552195
Presidential Variable	0.0731921	0.2872481	0.25	0.799	-0.4898039	0.636188
Bases with Similar Mission	-0.0043258	0.0057487	-0.75	0.452	-0.015593	0.0069413
Mission Variable	0.378264	0.2549753	1.48	0.138	-0.1214784	0.8780063
Constant	-1.457048	0.6722893	-2.17	0.03	-2.774711	-0.1393851

An evaluation was conducted of the model's ability to predict the outcome of *Closed.* The full model was able to predict probabilities of closure between the range of 0 and 0.577 - almost three times the range of the economic model. This means that the highest probability an observation was assigned for closing was 58%. Residuals (the difference between the model's predicted and observed outcome) and Cook's statistics were computed for each observation in the sample – examining residuals and outliers is an important way to check the fit of a particular regression model (Pregiborn, 1981). The graphs for the residuals, ROC curve, and cutoff point can be found in Appendix 4. One observation was classified as an outlier and nine observations were found to be high-leverage points; however no observations could be rejected on theoretical grounds.

A Wald test was conducted using the null hypothesis that defense contributions was equal to the National Security Index. This test was conducted to determine if the effects of these two independent variables are equal since there is a possibility they are measuring the same thing. Wald test results did not allow rejection of the null hypothesis – indicating that the effects are likely similar ($X^2 = 1.05$, df =1, $p = 0.305$). An interaction term was included in the regression for NSI and defense contributions but the product term was insignificant implying that the interaction effect was not statistically significant and need not be included (Jaccard, 2001, p. 16). Three variables were estimated with signs that do no fit the theoretical model (House Armed Services Cmt, House Seniority, and Presidential Var); however, all three variables are insignificant indicating that statistically they are no different than zero. Variables that are significant at the 0.10 level with a two tailed z-test include the following: acreage, army, state

delegation, defense contributions, and commission. A one tailed z-test can be used if the sign of a variable matches theory and observation and theory indicate that the variable will only have that sign. Under these criteria, the House Majority variable, the National Security Index score, and the Mission variable would all be significant at the 0.10 level.[56] The significance of many political variables supports anecdotal evidence and indicates that political effects continued to play a role in the BRAC closure process despite attempts to eliminate them.

One way to determine the effects of the political and other variables on the probability of closure is to look at the odds ratios that are computed in the logistic regression analysis. The key column in Table 14 is the percent column. This column lists the percent changes in the odds of a base closing for a one unit change in any independent continuous variable. For example, for every 1,000 acres owned by a base, there is a 1.5% decrease in the odds that the base will be closed. As before, dummy variable percent changes indicate the percent change when the variable is applicable versus when it is not. Note that Table 14 includes both significant and insignificant variables with significant variables denoted by asterisks.

The political variables in Table 14 are of particular interest because of the magnitude of their effects.[57] For instance, special interest effects through the size of the state delegation can have a large impact (99% increase) in the odds a base is closed. The

[56] A one tail z-test can be quickly performed by dividing the p-value of the two-tailed z-test by two.
[57] Note: The nonlinearity of the model makes it more difficult to interpret the effects of x and the probability of an event occurring. In nonlinear models the effect of a change in a variable depends on the values of all variables in the model and is no longer simply equal to one of the parameters of the model.

largest impact is provided by the commission – if the commission gets involved there is a 384% increase in the odds a base will be selected for closure.

Table 14. Percent Change in Odds - Full Model 1

logistic (N=1456): Percentage Change in Odds

Odds of: 1 vs 0

Closed	b	z	P>z	%	%StdX	SDofX
Acreage (1,000)	-0.01531	-2.427	0.015 *	-1.5	-96.8	224.4173
Total DoD Personnel (1,000)	-0.01075	-0.586	0.558	-1.1	-7.9	7.6457
Major Bases in State	0.00631	0.714	0.475	0.6	11.6	17.4138
Per Capita Def Spend (1,000)	-0.14684	-0.564	0.572	-13.7	-9.5	0.6765
Army Variable	0.60297	1.965	0.049 *	82.8	30.1	0.4363
Navy Variable	0.22694	0.785	0.433	25.5	11.6	0.4821
State Delegation Size	-4.83367	-1.945	0.052 *	-99.2	-32.8	0.0821
Senate Armed Services Cmt	-0.10812	-0.424	0.671	-10.2	-5.2	0.4972
Senate Defense Subcmt	-0.09044	-0.325	0.745	-8.6	-4.3	0.485
Senate Majority	-0.04274	-0.262	0.794	-4.2	-3	0.7238
Senate Seniority	-0.00587	-0.333	0.739	-0.6	-4.7	8.1346
House Armed Services Cmt	0.10416	0.315	0.753	11	4.9	0.4626
House Defense Subcmt	-0.01947	-0.031	0.975	-1.9	-0.5	0.2319
House Majority	-0.40576	-1.569	0.117 **	-33.4	-18.3	0.4968
House Seniority	0.00968	0.76	0.447	1	8.2	8.1025
Defense Contributions (1,000)	-0.01467	-1.72	0.085 *	-1.5	-28.4	22.7544
National Security Index Score	-0.0046	-1.217	0.224	-0.5	-15.4	36.3655
Commission Variable	1.5768	3.168	0.002 *	383.9	23.2	0.1325
Presidential Variable	0.07319	0.255	0.799	7.6	3.3	0.4423
Bases with Similar Mission	-0.00433	-0.752	0.452	-0.4	-8.4	20.2075
Mission Variable	0.37826	1.484	0.138 **	46	18.2	0.4415

b = raw coefficient
z = z-score for test of b=0
P>|z| = p-value for z-test
% = percent change in odds for unit increase in X
%StdX = percent change in odds for SD increase in X
SdofX = standard deviation of X

*Significant at 0.10 or better (two-tailed z-test)
**Significant at 0.10 or better (one-tailed z-test)

It is interesting to note that the amount of defense contributions has the hypothesized effect on the selection of bases. Bases whose representatives received defense contributions had the odds of their base selected for closure decrease by 1.5% for every

$1,000 of contributions. This result provides evidence that rent-seeking efforts were effective. Finally, if a one tailed z-test is used, the House Majority variable and the Mission variable will also be significant in the model with both providing a large percentage change in the odds a base is selected for closure.

The full model was re-analyzed by clustering the bases to see if independence of observations was a problem because most bases entered the database four separate times. It was hypothesized that there would not be an independence of observation problem due to the number of political and economic variables that changed over the four BRAC closure rounds for each observation. The results of the clustered regression analysis are found in Appendix 4 and confirm the hypothesis – there is no need to cluster the database. Overall, the model that includes political variables is more significant and provides better predictive quality than the model with just economic and mission variables. Logistic regression analysis provides strong statistical support for the inclusion of theoretically relevant political effects.

Model 1 can be simplified by rerunning the model and only including independent variables that were statistically significant. Table 15 provides the results of the simplified model. The signs in this model are all consistent with theory, the overall model is significant and all but two of the independent parameters are highly significant. Appendix 4 provides a comparison of this model to the economic/mission model estimated earlier and finds very strong support for the inclusion of political variables to the economic model.

Table 15. Simplified Version of Model 1

Logit estimates — **Number of obs = 1456**; **Wald chi2(7) = 41.59**; **Prob > chi2 = 0.0000**

Log likelihood = -321.20544 — **Pseudo R2 = 0.0782**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.017528	0.0058394	-3.00 *	0.003	-0.028973	-0.0060829
Army Variable	0.4630417	0.2493335	1.86 **	0.063	-0.0256429	0.9517263
State Delegation Size	-6.697431	2.048386	-3.27 *	0.001	-10.71219	-2.682669
House Majority	-0.2508812	0.2176326	-1.15	0.249	-0.6774333	0.1756708
Defense Contributions (1,000)	-0.0162713	0.0069451	-2.34 *	0.019	-0.0298834	-0.0026592
Commission Variable	1.559405	0.4781756	3.26 *	0.001	0.6221985	2.496612
Mission Variable	0.2940802	0.2429489	1.21	0.226	-0.1820909	0.7702513
Constant	-1.818495	0.266893	-6.81 *	0	-2.341596	-1.295394

*Significant at 0.10 or better (two-tailed z-test)

**Significant at 0.10 or better (one-tailed z-test)

Previous BRAC empirical work that is similar in nature to the work presented here has typically used a hazard model to test the political and economic effects on base closures. Specifically, Bielling (1996) used the Cox proportional hazard model to test the effects a suite of economic and political variables had on the length of time a base survived closure decisions.[58] Bielling considered how long it took a base to be selected for closure (fail) over the period 1961 to 1995. Although her work did not specifically target the BRAC years, it is interesting to apply a hazard rate model to the primary database from this work to see if the results are similar to the logistic model. To compute the hazard model it was necessary to add a time component to the database that accounted for the length of time that transpired between the first closure round and the selection of a base for closure. Bases that were closed were coded as failures and were

[58] Bielling's work did not consider many of the political variables included in this work including: defense contributions, NSI score, state delegation size, and a Presidential variable.

given a time stamp that indicated how long they remained open through the BRAC process, while bases that remained open where treated as censored observations.

The hazard model provides results that are similar to the logistic model. For the economic/mission hazard model, the overall model was significant, coefficient signs followed theory, and the same variables were found to be significant as were found in the logistic model. The hazard model did have a lower pseudo R^2 than the logistic model but not by a large amount. The full hazard model, however, did not produce the same results as the full logistic model. Many of the political and economic variables that were found to be significant in the logistic model were also found to be significant in the hazard model. However, the following differences were noted: the number of major bases in the state and the per-capita defense spending variables were significant in the hazard model and were not significant in the logistic model, the state delegation size and the house majority were not significant in the hazard model and were in the logistic model, and the presidential variable was significant in the hazard model but did not have the hypothesized sign. Also, many of the insignificant variables in the hazard model did not have the hypothesized sign. These differences are attributable to the different approaches of the models. The hazard model is looking at the time to failure while the logistic model is looking at whether the failure occurred. As before, the pseudo R^2 of the hazard model was lower than the logistic model. Regression output tables for the hazard models are presented in Appendix 4.

Model 2

Model 2 modifies the base model by only considering military facilities with greater than 300 personnel that are classified as active duty bases (most figures and tables for this model are included in Appendix 5). An analysis of the summary statistics for model two indicates that 260 observations were removed from the database. Each of the removed bases was classified by the Pentagon as being under the control of the National Guard or the Reserves. The range of the summary statistics is very similar to model 1 indicating that eliminating the Guard and Reserve bases did not impact the breadth of the database.

As with model 1, the initial regression analysis of model 2 only contained economic and mission variables while the second analysis added relevant political variables. The method of comparison was to look at the overall significance of the models and individual variables. It is hypothesized that the political/economic/mission model will be more significant than the economic/mission model.

Table 16. Economic/Mission Version of Model 2

Logit estimates — **Number of obs = 1196**; **Wald chi2(8) = 22.25**; **Prob > chi2 = 0.0045**; **Log likelihood = -285.35471**; **Pseudo R2 = 0.0695**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.030182	0.0117742	-2.56	0.01	-0.053259	-0.007105
Total DoD Personnel (1,000)	-0.0160509	0.0216618	-0.74	0.459	-0.0585072	0.0264055
Major Bases in State	0.0183357	0.0064385	2.85	0.004	0.0057164	0.030955
Per Capita Def Spend (1,000)	-0.6754283	0.2484251	-2.72	0.007	-1.162333	-0.1885241
Army Variable	0.2367448	0.3192242	0.74	0.458	-0.3889231	0.8624128
Navy Variable	-0.2918438	0.3054839	-0.96	0.339	-0.8905813	0.3068937
Bases with Similiar Mission	-0.0014384	0.0060369	-0.24	0.812	-0.0132705	0.0103937
Mission Variable	0.156604	0.2742758	0.57	0.568	-0.3809666	0.6941745
Constant	-1.704377	0.3910692	-4.36	0	-2.470859	-0.9378956

Regressing economic and mission independent variables on the dependent variable *Closed*, gives the results found in Table 16. The model is significant overall, Wald chi2 of 22.25 and Prob > chi2 of 0.0045, and several independent variables are significant. With the exception of "bases with similar mission," all independent variables have the hypothesized sign. The "bases with similar mission" variable enters the regression equation insignificant so the sign is not troubling. The overall model has slightly better measures of fit (Appendix 5) than the economic version of model 1 indicating that the elimination of Guard and Reserve bases allows for slightly better specification of the dependent variable. Appendix 5 also includes the cutoff graph and the ROC graph for the economic model. The cutoff point was computed to be 0.072 and the area under the ROC curve was 0.7034, just in the range of acceptable discrimination. Overall the model is able to correctly classify 54.93% of the observations. The model is also able to provide a range of prediction up to 22.3% for a given base, which is similar to model 1.

The percentage change in odds for each independent variable is displayed in Table 17. All independent variables are listed in the table with statistically significant variables identified by asterisks. Compared to the economic version of model 1, this economic model has fewer statistically significant variables; however, relevant variables tend to provide a larger change in the percent odds. The acreage, number of major bases in the state, and per capita defense spending variables are significant and impact the odds a base is selected for closure. The mission variable and Army variable are no longer statistically significant, indicating that political and economic effects may be more important when considering only active duty bases.

Table 17. Percent Change in Odds - Economic/Mission Model 2

logistic (N=1196): Percentage Change in Odds

Odds of: 1 vs 0

Closed	b	z	P>z	%	%StdX	SDofX
Acreage (1,000)	-0.03018	-2.563	0.010 *	-3.0	-99.9	246.689
Total DoD Personnel (1,000)	-0.01605	-0.741	0.459	-1.6	-12.1	8.0006
Major Bases in State	0.01834	2.848	0.004 *	1.9	39.1	18.0095
Per Capita Def Spend (1,000)	-0.67543	-2.719	0.007 *	-49.1	-36.5	0.6735
Army Variable	0.23674	0.742	0.458	26.7	11.3	0.4521
Navy Variable	-0.29184	-0.955	0.339	-25.3	-13.5	0.495
Bases with Similiar Mission	-0.00144	-0.238	0.812	-0.1	-2.9	20.8077
Mission Variable	0.1566	0.571	0.568	17.0	7.4	0.4578

b = raw coefficient

z = z-score for test of b=0

P>|z| = p-value for z-test

% = percent change in odds for unit increase in X

%StdX = percent change in odds for SD increase in X

SDofX = standard deviation of X

*Significant at 0.10 or better (two-tailed z-test)

**Significant at 0.10 or better (one-tailed z-test)

Overall, the economic/mission model is significant and does indicate that economic variables were statistically significant when closing major active duty bases during BRAC as was hypothesized in previous chapters. These results, combined with the results from the economic version of model 1, answer research question two and confirm the hypothesis that economic/mission variables were important in the odds a base was selected for closure. Specifically, the size of the base, the number of bases in the state, the per capita defense spending in the state, and possibly the mission and service that operated the base were important to determining which bases closed and which remained open. The specific quantitative effects of each variable are found in Tables 11 and 17.

The second version of model 2 is the full logistic regression which adds political variables to the economic/mission model. As in model 1, it is hypothesized that many

political variables will be significant. The output in Table 18 indicates that the overall model is significant and is a better model than the economic model (larger R^2 and larger Wald chi2). Also, several of the political variables are statistically significant (see Table 19).

Table 18. Regression Results - Full Version of Model 2

Logit estimates — **Number of obs = 1196**
Wald chi2(21) = 54.85
Prob > chi2 = 0.0001
Log likelihood = -271.6876 — **Pseudo R2 = 0.1140**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0236518	0.0105206	-2.25	0.025	-0.0442717	-0.0030318
Total DoD Personnel (1,000)	-0.0255373	0.0244042	-1.05	0.295	-0.0733687	0.0222941
Major Bases in State	0.0080366	0.0090665	0.89	0.375	-0.0097335	0.0258067
Per Capita Def Spend (1,000)	-0.3091698	0.2951494	-1.05	0.295	-0.887652	0.2693124
Army Variable	-0.0422112	0.3415453	-0.12	0.902	-0.7116277	0.6272053
Navy Variable	-0.3858316	0.3042312	-1.27	0.205	-0.9821137	0.2104506
State Delegation Size	-3.494098	2.374981	-1.47	0.141	-8.148975	1.16078
Senate Armed Services Cmt	-0.0536021	0.2693304	-0.2	0.842	-0.5814799	0.4742757
Senate Defense Subcmt	-0.0805668	0.302036	-0.27	0.79	-0.6725465	0.5114128
Senate Majority	-0.0041798	0.1729605	-0.02	0.981	-0.3431762	0.3348167
Senate Seniority	-0.00715	0.0192653	-0.37	0.711	-0.0449093	0.0306093
House Armed Services Cmt	0.0990975	0.3352793	0.3	0.768	-0.5580377	0.7562328
House Defense Subcmt	0.0242927	0.6255921	0.04	0.969	-1.201845	1.250431
House Majority	-0.4680541	0.2784178	-1.68	0.093	-1.013743	0.0776349
House Seniority	0.0039725	0.0136625	0.29	0.771	-0.0228055	0.0307505
Defense Contributions (1,000)	-0.0160552	0.0083966	-1.91	0.056	-0.0325122	0.0004017
National Security Index Score	-0.0086368	0.0041592	-2.08	0.038	-0.0167887	-0.0004848
Commission Variable	1.744212	0.5097269	3.42	0.001	0.745166	2.743259
Presidential Variable	0.0433508	0.3183615	0.14	0.892	-0.5806263	0.6673279
Bases with Similar Mission	-0.0006977	0.0067363	-0.1	0.918	-0.0139005	0.0125051
Mission Variable	0.239966	0.291098	0.82	0.41	-0.3305756	0.8105077
Constant	-0.5402282	0.7102956	-0.76	0.447	-1.932382	0.8519257

Using the same cutpoint as the economic version of the model indicates that the full model correctly specifies 65.47% of the observations which is an increase over the

economic model. Additionally, the ROC curve for the full model is 0.7469 indicating that the full model provides an acceptable level of discrimination. Residuals and Cook's statistics were also computed. The graphs for the cutoff point, ROC curve, and residuals can be found in Appendix 5. Using the predict command an evaluation was conducted of the model's ability to predict the outcome of *Closed.* The full version of model 2 was able to predict probabilities of closure between the range of zero and 0.6447, much larger than the economic model and slightly larger than the full version of model 1. This means that the highest probability an observation was assigned for closing was 64%. A Wald test was conducted using the null hypothesis that defense contributions was equal to the National Security Index. This test was conducted to determine if the effects of these two independent variables are equal since there is a possibility they are measuring the same thing. The Wald test did not allow rejection of the null hypothesis – indicating that the effects are likely similar ($X^2 = 0.57$, df =1, p = 0.4488).

Four variables were estimated with signs that do no fit the theoretical model (House Armed Services Cmt, House Defense Cmt, House Seniority, and Presidential Var); however, all four variables are insignificant indicating that statistically they are no different than zero. Variables that are significant at the 0.10 level or better with a two tailed z-test include the following: acreage, house majority, defense contributions, national security index score, and commission. Using a one-tailed z-test, the State Delegation variable is significant at the 0.10 level. The significance of so many political variables again indicates that political effects continued to play a role in the BRAC closure process when only considering active duty bases.

The percent change in odds in Table 19 helps determine the effects of each variable on the probability of closure.

Table 19. Percent Change in Odds - Full Model 2

logistic (N=1196): Percentage Change in Odds

Odds of: 1 vs 0

Closed	b	z	P>z	%	%StdX	SDofX
Acreage (1,000)	-0.02365	-2.248	0.025 *	-2.3	-99.7	246.6893
Total DoD Personnel (1,000)	-0.02554	-1.046	0.295	-2.5	-18.5	8.0006
Major Bases in State	0.00804	0.886	0.375	0.8	15.6	18.0095
Per Capita Def Spend (1,000)	-0.30917	-1.048	0.295	-26.6	-18.8	0.6735
Army Variable	-0.04221	-0.124	0.902	-4.1	-1.9	0.4521
Navy Variable	-0.38583	-1.268	0.205	-32	-17.4	0.495
State Delegation Size	-3.4941	-1.471	0.141 **	-97	-25	0.0822
Senate Armed Services Cmt	-0.0536	-0.199	0.842	-5.2	-2.6	0.4968
Senate Defense Subcmt	-0.08057	-0.267	0.79	-7.7	-3.8	0.4833
Senate Majority	-0.00418	-0.024	0.981	-0.4	-0.3	0.7144
Senate Seniority	-0.00715	-0.371	0.711	-0.7	-5.8	8.3214
House Armed Services Cmt	0.0991	0.296	0.768	10.4	4.8	0.4767
House Defense Subcmt	0.02429	0.039	0.969	2.5	0.6	0.241
House Majority	-0.46805	-1.681	0.093 *	-37.4	-20.7	0.4968
House Seniority	0.00397	0.291	0.771	0.4	3.2	8.0333
Defense Contributions (1,000)	-0.01606	-1.912	0.056 *	-1.6	-31.4	23.437
National Security Index Score	-0.00864	-2.077	0.038 *	-0.9	-26.3	35.3547
Commission Variable	1.74421	3.422	0.001 *	472.1	26.4	0.1344
Presidential Variable	0.04335	0.136	0.892	4.4	1.9	0.4388
Bases with Similar Mission	-0.0007	-0.104	0.918	-0.1	-1.4	20.8077
Mission Variable	0.23997	0.824	0.41	27.1	11.6	0.4578

b = raw coefficient
z = z-score for test of b=0
P>|z| = p-value for z-test
% = percent change in odds for unit increase in X
%StdX = percent change in odds for SD increase in X
SdofX = standard deviation of X

*Significant at 0.10 or better (two-tailed z-test)
**Significant at 0.10 or better (one-tailed z-test)

In this model only one significant variable is not political in nature. The regression results demonstrate that money and special interests had an effect on the outcome of base closures. Specifically, the amount of defense contributions, the support of the

congressional representative of the base and the state delegation all work to improve the chances a base will stay open. The largest variable is still the commission. These results indicate that a base that receives the attention of the BRAC commission is almost 500% more likely to close than one that is not considered by the commissioners, this is a larger effect than that seen when guard and reserve bases are included indicating that the commission was more concerned with active duty bases. The state delegation influence is more tempered in this model and defense contributions play a slightly larger role. The NSI score and House Majority variables entered this model significantly indicating that past voting records and majority control (though logrolling) had measurable effects on closure decisions.

Overall, the model provides slightly better predictive quality when Guard and Reserve bases are excluded from the analysis. The improvement however, is small indicating that a model that retains guard and reserve bases will produce similar results to one that does not include them. The differences will mainly be manifest in the size of the impact that key political variables contribute to the chance a base will be selected for closure. The full version of model 2, like model 1, provides statistical support for the inclusion of theoretically relevant political effects. Model 2 was also re-analyzed by clustering the bases to see if independence of observations was a problem. As in model 1, it was hypothesized that there would not be an independence of observation problem due to the number of political and economic variables that changed over the years analyzed. The results of this regression run are found in Appendix 5 and confirm that there is not independence of observation issues.

Model 2 can also be simplified by rerunning the model and only including independent variables that were statistically significant. Table 20 provides the results of the simplified model.

Table 20. Simplified Version of Model 2

Logit estimates — **Number of obs = 1196**
Wald chi2(7) = 45.31
Prob > chi2 = 0.0000
Log likelihood = -274.05588 — **Pseudo R2 = 0.1063**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0247337	0.0092761	-2.67 *	0.008	-0.0429146	-0.0065528
Army Variable	-0.3846648	0.2390674	-1.61 **	0.108	-0.8532282	0.0838986
State Delegation Size	-5.700153	1.905688	-2.99 *	0.003	-9.435232	-1.965074
House Majority	-0.4688527	0.2617637	-1.79 *	0.073	-0.9819001	0.0441948
Defense Contributions (1,000)	-0.0161788	0.0069615	-2.32 *	0.020	-0.0298231	-0.0025346
Commission Variable	1.725408	0.4861141	3.55 *	0.000	0.7726423	2.678174
Mission Variable	-0.0085219	0.0036759	-2.32 *	0.020	-0.0157265	-0.0013173
Constant	-0.7076698	0.3834939	-1.85 *	0.065	-1.459304	0.0439645

*Significant at 0.10 or better (two-tailed z-test)
**Significant at 0.10 or better (one-tailed z-test)

The signs in this model are all consistent with theory, the overall model is significant and all of the independent parameters are highly significant. Appendix 5 provides a comparison of this model to the economic/mission model estimated earlier and finds very strong support for the inclusion of political variables.

As with model 1, applying a hazard rate model to the database without Guard and Reserve bases yields similar results to the logistic model. For the economic/mission hazard model, the overall model was significant, coefficient signs followed theory, and most of the same variables were significant with the following exceptions: in the hazard model, two more variables were significant – the Navy variable and the variable that

accounts for bases with similar missions. Logically it is not surprising that these variables were found to be significant as the Navy was able to delay the closing of its bases the longest and over time bases with similar missions were closed due to overlap of capability. Both hazard models had a lower pseudo R^2 than the logistic models but not by a large amount. Many of the political and economic variables that were found to be significant in the full logistic model were also found to be significant in the full hazard model. However, the following differences were noted: the number of major bases in the state, the Navy variable, the Senate Armed Services Cmt, and the per-capita defense spending variables were significant in the hazard model and were not significant in the logistic model, the state delegation size and the house majority were not significant in the hazard model and were in the logistic model, and the presidential variable was significant in the hazard model but did not have the hypothesized sign (See Appendix 5 for regression results). As in model 1, these differences are attributable to the different approaches of the models. The hazard model is looking at the time to failure while the logistic model is looking at whether the failure occurred.

Regression results from both political models provide strong quantitative support for the hypothesis of research question three. Political forces did and will play roles in base closure processes despite the formation of "independent commissions" that seek to eliminate these forces. Specifically, special interest groups have a strong, economically driven self-interest to find ways to manipulate and influence the closure process. The effects of asymmetric information, logrolling, political funding, and rent-seeking all combine to provide powerful incentives for political actors to equalize the marginal

benefits and marginal costs of their interests. The specific magnitudes of the political effects were presented in Tables 14 and 19.

Summary of Findings

This chapter describes the variables in the database, sets forth limitations in the data, and provides quantitative values to the theoretical model previously developed. A key objective of this work was to investigate the effects political variables had on the base closure process. From a theoretical perspective, it was logical to assume that politics was not removed by the BRAC commission and there is much anecdotal evidence to support this logic. Conversely, little robust statistical work has been accomplished to verify theoretical postulates and identify the magnitude of the political and economic effects.

The quantitative results of this work provide strong evidence that politics matter, even when politics are inherently de-emphasized by the process. Table 21 presents a summary of the significant variables from the full models and the percent change in odds that a base will be closed for each significant variable. Both Model 1 and 2 are significant and relevant to understanding the political factors at work during BRAC. The models indicate that if a base is represented by a House member who is in the majority, there is a 33% to 37% decrease in the odds that the base will be closed compared to a base that is not represented by the majority party in the House. Quantitative results also indicate that for every $1,000 spent in campaign contributions by special interests, there is a 1.5% decrease in the odds a base is closed. Campaign contributions of $10,000 can

decrease the odds a base is closed by 15%. Previous BRAC work has not considered the effect of special interest through defense contributions.

Table 21. Summary of Findings – Full Model 1 and 2

	Full Model 1	Full Model 2
Log likelihood	-317.97089	-271.6876
Number of obs	1456	1196
Wald chi2	58.39	54.85
Prob > chi2	0.0000	0.0001
Pseudo R2	0.0875	0.1140
Percent Change in Odds		
Acreage (1,000)	-1.5 *	-2.3 *
Army Variable	82.8 *	
State Delegation Size	-99.2 *	-97 **
House Majority	-33.4 **	-37.4 *
Defense Contributions (1,000)	-1.5 *	-1.6 *
National Security Index Score		-0.9 *
Commission Variable	383.9 *	472.1 *
Mission Variable	46 **	

*Significant at 0.10 or better (two-tailed z-test)

**Significant at 0.10 or better (one-tailed z-test)

The state delegation variable also indicates that state special interests can decrease the odds a base is closed through logrolling efforts.[59] Results indicate that ideology as measured by NSI scores were only relevant when considering larger active duty bases. Also, the commission variables were significant and accounted for a large change in the odds a base was closed. If the commission was involved in modifying the Pentagon's

[59] The state delegation variable was transformed to allow logrolling efforts to be diminished as the number of participants increased. It is hypothesized that logrolling efforts are more successful with smaller number of participants and tend to decrease as the number of participants rise due to coordination and commitment problems.

recommendations, there was a 383% to 472% increase in the odds a base was closed. The service (Army) and mission variables were only significant in model 1, providing a motivating factor to conduct the sensitivity analysis in the following chapter. There is also a great deal of anecdotal evidence that the services approached the BRAC process from different perspectives leading to further need to stratify the database by service.

Comparing the results of this work to similar studies (Bielling, 1996) indicates that even though political effects were not completely removed the BRAC process did temper them. Results indicate that future BRAC closure rounds should consider political forces when outlining and proceeding through additional base closures and that it is naïve to think that a process can be designed that will completely remove the self-interested aspects of human actors. By considering political variables, the Pentagon can better understand which bases are more easily closed and which will take a considerably amount of time and scarce resources to overcome strong political and local opposition. It is not unlikely that selecting an economically inefficient base for closure may be more expensive than closing an efficient base because of the cost of overcoming political forces associated with the inefficient base.

Chapter 6. Sensitivity Analysis and Future Closure Projections

Chapter Overview

This chapter extends the analysis of Chapter 5 by conducting sensitivity analysis on each model to isolate the effects when considering a specific closure round, a specific branch of the military, and the Pentagon's classification of major bases. Because there is strong theoretical and empirical evidence for the inclusion of political variables, sensitivity analysis is only conducted on the full models and not on the economic/mission models. Regression results are presented in a summary format with the full output located in Appendices 6 and 7.

The second half of the chapter applies the quantitative results of Chapter 5 and the sensitivity analysis developed in this chapter to a database of economic, mission, and political variables for current military facilities with more than 300 assigned personnel. The projection work provides a unique analysis of which bases are most likely to be selected for closure in 2005 if a similar independent BRAC commission process is followed. Elected representatives and local communities can use the projections to decide how hard to oppose a particular closure effort versus working with the Pentagon and future commissions to transition unneeded military facilities to commercial ventures.

Sensitivity Analysis

Sensitivity analysis is conducted to examine whether variables specific to the individual military services and BRAC years are masked by the aggregated data analysis of Chapter 5. The base closure process has historically been a stochastic one with many of the relevant variables changing over time and thus possibly altering the quantitative function to be described. Learning occurs over time, the different services approach the process differently, new Congressional Representatives and Presidents are elected, campaign contributions are fluid, and Secretaries of Defense change over time. Any of these factors can work to alter some aspect of the base closure process. It is hardly surprising that the process is criticized, evaluated, supported, and attacked by so many different people from so many different angles. Stratifying the data set by year and service may provide insight into specific key variables that drove the process over the eight-year period.

Model 1

Political economy theory indicates that learning can occur over time when economic and political actors are able to efficiently determine how to manipulate political processes. A breakout of the BRAC database by closure year provides a method to check for learning that may have occurred during the process. Appendix 6 provides logistic regression results for each of the four years of base closure for model 1. The model structure is the same as the full model evaluated in Chapter 5. The summary results in Table 22 indicate that each of the year models is significant at the 0.05 level or better using a two-tailed z-test. Additionally, each models measures of fit have increased by

significant amounts over the aggregate models indicating that stratifying the data by year is an appropriate method for better understanding the political and economic effects of the BRAC process. The results in table 22 also provide some support for learning over time.[60]

Table 22. Year Summary – Model 1

Area of Interest	Model - "Year"			
	1988	1991	1993	1995
Number of observations	372	383	356	310
Log Liklihood	-47.969	-80.562	-76.308	-65.919
Wald chi2	92.62	64.82	32.16	62.09
Prob>chi2	0.000	0.000	0.056	0.000
Pseudo R^2	0.237	0.152	0.222	0.242
Area under ROC curve	0.865	0.804	0.845	0.845
Percent Correctly Specified	74.73%	71.02%	72.75%	78.06%
Range of Prediction	0 to 0.584	0 to 0.563	0 to 0.426	0 to 0.913
Significant Variables (two tailed, 0.10 or less)	None	Acreage Mission Var	Acreage Navy Senate Majority	# of Personnel Army House Seniority Commission Var
Additional Significant Var one tailed, 0.10 or less)	# of Personnel Army Senate Armed Serv Senate Majority Senate Seniority Defense Contrib NSI	State Delegation Senate Majority	State Delegation Senate Seniority Defense Contrib	Navy Senate Armed Serv

Recall that when the first round was legislated there were no provisions for additional rounds, leading to a possible one-round interaction exchange; however, no one group or organization tried very hard to block the process because there was acknowledgement that closures needed to proceed. In this context, it is not surprising to find that no

[60] Note: Thirty five observations were dropped by Stata when the database was stratified by year due to perfect correlation between a dependent variable and the independent variable.

variables were found to be significant at the 0.10 level when using a two-tailed z-test for the 1988 round.[61]

As mentioned previously, there is good reason for using the less conservative one tailed z-test. When this approach is used, seven variables are significant at the 0.10 level and the model is overall significant. This result indicates that political effects were tempered but active in the first round of closure as political actors attempted to understand the process and make cautious adjustments. In later years, there is an increase in the number of variables that are significant at the 0.10 level using a two-tailed z-test – indicating that knowledge about the process was learned and used in an influential manner. The models provide a good measure of fit for logistic results, levels of specificity (ROC) are good, and the predicted probability for closure range is similar but better than the full model. The exception is the last year where the predicted probability for closure range entered the 90% level. Overall results indicate that learning existed but was limited, likely due to the independent nature of the commission. The commission was likely susceptible to a limited amount of increased political posturing as the closure rounds progressed. Anecdotal evidence supports the limited learning results.

Table 23 lists the change in the odds ratio for each of the independent variables for each of the four BRAC years. As in previous change in odds tables, the percent change in odds for a one unit change in independent variables is presented. Several parameters are significant at different z-test levels. Also, some independent variables were dropped

[61] The one exception is the mission variable which was expected to be significant because the Pentagon indicated that it was the driving force in selecting bases for closure throughout the BRAC process.

in different years due to the perfect predictive quality associated with those parameters. This result is to be expected because of the number of dummy variable parameters included in the study and the limited number of observation that are available when the database is broken down by year.

Table 23. Year Percent Change in Odds – Model 1

	Model - "Year" - Percent Change in Odds			
Var of Interest	**1988**	**1991**	**1993**	**1995**
Acreage	-0.3	-2.8 *	-5.3 *	-0.6
Total DoD Personnel	-11.9 **	3.0	1.1	-9.0 *
Major Bases in State	3.2	0.0	0.2	1.6
Per Capita Def Spending	-42.7	-32.5	7.2	-16.8
Army	227.3 **	-38.3	-46.8	872.2 *
Navy	-68.6	-44.2	185.2 *	213.4 **
State Delegation	552.1	-99.9 **	-100.0 **	-9.2
Seanate Armed Serv	373.1 **	49.9	0.0	-54.7 **
Senate Def Committee	56.5	-7.9	66.5	-15.1
Senate Majority	-44.7 **	-41.6 **	178.9 *	26.3
Senate Seniority	-9.9 **	4.0	6.2 **	-0.8
House Armed Serv	246.3	-61.8	65.5	53.3
House Def Committee	dropped	-13.7	159.4	dropped
House Majority	-61.5	-33.7	-31.0	1.0
House Seniority	-3.3	-1.7	1.4	6.6 *
Defense Contributions	-4.0 **	0.1	-2.8 **	-1.0
NSI	-1.9 **	-1.1	-0.3	-0.6
Commission Var	dropped	558.9	30.5	2385.9 *
Presidential Var	-54.9	138.5	-49.7	12.2
Bases with Similiar Miss	0.8	-0.4	-0.4	0.4
Mission Var	69.4	148.4 *	46.0	-48.1

* = signficant at 0.10 or better (two-tailed z-test)

** = significant at 0.10 or better (one-tailed z-test)

Independent variables that were found to be significant in at least two of the four closure rounds include: acreage, total personnel, army dummy, state delegation, senate armed services committee, senate majority, senate seniority, and defense contributions.

In every year either acreage or number of personnel was significant indicating that the size of the base was important. The Navy variable became significant in the last two rounds which is consistent with the results of the hazard model from Chapter 5. The commission was most influential in '91 and '95 ('91 was the first round of a three round process and '95 was the final closure round). The mission variable was only significant in 1991 – the closest round to the end of the Cold War. Each of these results is consistent with theory and other empirical evidence and indicates that political variables were operating throughout the closure process.

The second sensitivity analysis considers each branch of the military separately. Because of unique service differences it is reasonable to assume that the individual services approached the closure process from different perspectives. The differing

Table 24. Service Summary – Model 1

Area of Interest	Model - "Service"		
	Air Force	**Army**	**Navy/Marines**
Number of observations	550	372	534
Log Liklihood	-86.370	-79.259	-117.554
Wald chi2	50.17	32.78	35.88
Prob>chi2	0.000	0.025	0.011
Pseudo R^2	0.258	0.181	0.126
Area under ROC curve	0.872	0.815	0.776
Percent Correctly Specified	76.910	68.550	67.040
Range of Prediction	0 to 0.817	0 to 0.526	0 to 0.481
Significant Variables (two tailed, 0.10 or less)	Acreage # of Personnel Commission Var Presidential Var Mission Var	Acreage # of Personnel Per Capita Def Spend Senate Majority NSI	Senate Armed Serv Defense Contrib Presidential Var
Additional Significant Var one tailed, 0.10 or less)	House Armed Serv	None	State Delegation Mission Var

perspectives may allow differing economic and political effects to manifest themselves. For purposes of this analysis, the Marine Cops was grouped with the Navy because there were not enough Marine Corps observations to be analyzed separately and in the chain of command the Marines are under the Navy for senior level decision making and funding. Considering each service separately produced the results in table 24. Each of the models is significant at the 0.05 level or better and measures of fit are significantly higher than the base models from Chapter 5 that were not stratified by service. Several of the independent variables were found to be significant, specificity is excellent, and observations correctly specified and range of predictions are acceptable.

Table 25 provides the change in odds for each service model and indicates which parameters are significant considering both a two and one tailed z-test. Air Force results are consistent with theoretical postulates about the way it closed bases. The Air Force was particularly vulnerable during the closure process because of the many strategic bombing bases that had lost their mission with the demise of the cold war. These results are consistent with the regression output as the mission variable entered positively with a high change in the odds of effecting the probability of closure. It also explains why the personnel number was overall positive (opposite of theory). Most of the bases that had a strategic bombing mission had large numbers of personnel assigned to keep alert aircraft ready for nuclear war. Closing these bases closed facilities where large numbers of personnel were assigned – leading to a positive sign in the total personnel variable. The House Armed Services committee variable was significant and this is consistent with the effort the Air Force has historically placed on keeping close ties with house members to

influence political decision making. It also may indicate that many house members were able to protect their Air Force bases as was demonstrated by anecdotal evidence in chapter three. The commission took particular notice of the Air Force as is was the service that was most affected by the commission process.

Table 25. Service Percent Change in Odds – Model 1

	Model - "Service" - Percent Change in Odds		
Var of Interest	**Air Force**	**Army**	**Navy**
Acreage	-8.1 *	-0.6 *	-3.8
Total DoD Personnel	7.9 *	-17.1 *	-0.3
Major Bases in State	2.4	1.0	0.3
Per Capita Def Spending	-27.0	-55.6 *	-21.9
State Delegation	-99.4	6132.7	-100.0 **
Seanate Armed Serv	59.1	83.9	-68.0 *
Senate Def Committee	33.6	-48.7	-15.1
Senate Majority	-2.7	-46.4 *	24.1
Senate Seniority	-3.2	-2.8	1.2
House Armed Serv	-64.7 **	33.7	66.5
House Def Committee	-17.4	270.0	-8.9
House Majority	-32.2	-16.7	-5.8
House Seniority	2.4	-0.9	2.0
Defense Contributions	-1.3	0.3	-2.9 *
NSI	0.5	-1.2 *	-0.0
Commission Var	906.9 *	194.3	153.6
Presidential Var	937.0 *	-43.1	-60.7 *
Bases with Similiar Miss	0.2	-1.2	1.3
Mission Var	430.3 *	112.2	-56.1 **

* = signficant at 0.10 or better (two-tailed z-test)
** = significant at 0.10 or better (one-tailed z-test)

The Army variables are also consistent with the approach it uses to decide which bases to retain. The Army tends to maintain relatively large facilities, in terms of acreage and personnel, and both of these variables were significant in the model and had the

theoretically postulated sign. Because Army facilities are large, they represent a large economic impact to the local community leading to a willingness of state representatives to fight particularly hard to keep Army facilities off closure lists. The Army basing strategy also tends to be represented by elected officials who are particularly hawkish in their defense outlook and this notion is supported by the significance of the NSI variable.

Finally, the Navy results are also consistent with the unique characteristics of most Navy bases – access to sea lanes. In the Navy regression, the state delegation, campaign contributions, and the Senate Armed Services committee were all significant. These variables are consistent with the fact that the Navy is mostly based in states with large coastal facilities – California, Texas, Florida, Virginia, Washington, and Hawaii. A large number of congressmen who have access to large campaign contributions represent most of these states. Individual states and special interest groups have invested large sums in the Navy's presence and therefore have a strong interest in seeing the Navy keep its bases open. Overall, each of the service models provides theoretically sound results and provides good insight into the unique process followed by the individual military services and their associated politicians. The high measure of fit and number of significant variables for each model indicate that when possible it is preferable to consider political and military service decision making separately rather than grouping the services together.

The last sensitivity analysis for model 1 uses a categorical variable found in the Base Structure Report. Using this variable it is possible to identify facilities in the database that the Pentagon considers major – a base that substantial contributes to

national security (versus the number of personnel assigned). Appendix 6 contains the regression results for the 643 observations that the Pentagon classified as "major" in the Base Structure Report The Wald chi2 for this regression was 58.02, the Prob>chi2 was 0.0000, and the Pseudo R^2 was 0.2197. The most interesting result from this regression is that it demonstrates that the Pentagon did follow its stated objective of closing facilities that had declining missions as the mission variable is significant and provides a large change in the odds of closure (126.8% increase in the odds of closure for bases with declining missions). Larger bases were protected as they allowed for consolidation and realignment of smaller activities. The per-capita defense spending and number of major bases were also important when major bases were considered for closure. As expected, the commission variable provided the largest change in the odds of closure. Political variables that were significant included: the senate defense committee, the house armed services committee, and house majority.

Overall, the stratification of data provides some interesting outcomes that match theoretical postulates and observed realities. Statistical results back theory and demonstrate that there was limited learning and that the services did approach the closure process differently - something that has been qualitatively discussed in numerous BRAC studies and reports. Results also demonstrate that the Pentagon did focus on recommending bases for closure with declining or obsolete missions.

Model 2

Sensitivity analysis was also conducted on model 2 to investigate if any differences were prevalent when Guard and Reserve bases were eliminated from consideration. Only

significant differences between the sensitivity analysis on model 2 and the sensitivity analysis conducted on model 1 are presented. All regression outputs for the sensitivity analysis of model 2 are presented in Appendix 7.

Analysis of the BRAC database by year indicates that model 2 results have slightly better measures of fit and specificity. There is evidence that learning occurred over time and additional political variables become significant which supports the theory that congressman are more interested in the political and economic benefits of larger bases versus smaller bases. Analysis of the BRAC database by service indicates that model 1 (inclusion of all military facilities) provides a better specified model than model 2. This outcome is likely due to the services considering their total force structure when recommending which bases to close. The services consider guard and reserve forces as part of the total force and view them as necessary to accomplishing the mission of national security. This macro view forces the military to consider all bases when looking at which facilities to close and which to keep open. As expected, model 2 contains additional significant political variables indicating that the larger a base the larger the political and economic impact and the more politicians are interested in the outcome of the base. Analysis of the database by Pentagon defined major bases was almost identical for model 1 and model 2. This result was expected because essentially the same bases were considered in both regressions. The DoD only classified a few very large reserve bases as being major so the number of deleted observation in the more restrictive model 2 was only about 5 bases per year. Because of the similarity of results, this stratification of

the data is not necessary when considering the difference between guard and reserve bases and active duty bases.

Overall, the results of the sensitivity analysis on model 2 are very similar to those on model 1. All of the models provide good support for the effects of numerous political variables. Results of both models also provides good reasons for parsing the database to identify underlying effects that are likely masked by the general models of Chapter 5. The tradeoff is the additional work needed to separate out the data to get at individual variable results. The projection analysis in the next section uses the service results and the overall results from the general model to project which bases will most likely be selected for closure in the future.

Application to Future Base Closure Efforts

A timely and unique extension of the analysis from Chapter 5 is to use the models to predict future closure efforts that have been authorized to begin in fiscal year 2005. In addition to the predictions of the two primary models, predictions are also made using the military service and Pentagon major base stratification results from this chapter. The objective of the predictions is to provide an indication of which bases are most likely to be closed if a process similar to BRAC is followed. If future closure are not conducted by means of an independent commission where the Pentagon makes recommendations that can be modified by a commission and that are difficult to overturn by the President and Congress, then the results presented in this section would not be applicable.[62]

[62] Note: All predictions are made using current data; however, to get the best results the projections will need to be recalculated using 2003 and 2004 data when it becomes available.

The method for conducting the projection work was to develop a new database using current economic, mission, and political variables. The same or similar variables used in the original database were collected for the projection database. Most of the same sources used previously were available for the projection database. For instance, the base structure report for 2002 listed all the bases with more than 300 personnel and was used for acreage and number of personnel assigned to each facility.[63] Congressional Quarterly was used for committee assignments, majority, and seniority variables; "Open Secrets" was used for current defense contributions; and the Center for Security Policy (CSP) scorecard was used for the ideology measure.[64] The date of publication for most data sources was the end of 2002, except for the base structure report, which was as of the end of 2001. The data for defense contributions and the CSP scorecard required the use of the 107th congress for all political variables. Ideally, the projection database would use the 108th Congress; however, defense contributions and ideology positions are not available for the entire current congress. The two variables included in the primary database that are not included in the projection database are the commission variable and the mission variable. The commission variable can only be included in historical analysis so it is not relevant to projection work and the mission variable is currently not easily developed because of the changing role the DoD is trying to adopt in the face of global terrorism threats. In the projection model, both of these variables were coded zero to

[63] The BSR was discontinued by the Pentagon after 1993; however, the report was reinstated beginning with fiscal year 1999.

[64] The 107th Congress began with a Republican majority in both houses of Congress; however, mid way through Senator Jeffords switched from a Republican to an Independent, leaving a split in the Senate. For purposes of this analysis, the Republicans were considered to be the Senate majority party in the projection database.

eliminate the effects associated coefficients would otherwise have on the probability of closure.

All projections are developed by using the specific form of the regression equation used to compute the coefficients from the primary database, the current data in the projection database, and the coefficients computed in Chapter 5 and in the sensitivity analysis in this chapter. The specific form of the regression model is:

(Eq 21)
$$\Pi(x) = \frac{e^{\beta_0+\beta_1 X+....\beta_K X_K}}{1+e^{\beta_0+\beta_1 X+....\beta_K X_K}}$$

where:

$\Pi(x)$ = the probability a base will be selected for closure

β_0 = the constant term computed in the various models

β_K = the coefficients computed in the various models, and

X_K = the independent parameters form the projection database

Model 1

Projection results for model 1 were computed using the full model, the Pentagon classification of major bases model, and the sensitivity analysis for the different services. Because approximately 20 major bases were closed during each of the past closure rounds, the 20 bases with the highest probability of closure are presented. The full model prediction results indicate that bases from across the country are at risk for future closure and that many of these bases are located in states where there are a large number of bases like California and Texas (Table 26).

Table 26. Model 1 and Pentagon Major Base Closure Projections

Full Model			Pentagon Major Base Model		
State	Service	Base	State	Service	Base
CA	Army	PRESIDIO MONTEREY	TX	Army	FORT SAM HOUSTON
NY	Army	WATERVLIET ARSENAL	TX	Air Force	LACKLAND AFB
IL	Army	ROCK ISLAND ARSENAL	TX	Air Force	DYESS AFB
IL	Army	CHARLES MELVIN PRICE SPT CTR	FL	Air Force	MACDILL AFB
NJ	Army	FORT MONMOUTH	IL	Air Force	SCOTT AFB
MI	Army	U.S. ARMY GARRISON SELFRIDGE	TX	Air Force	BROOKS AFB
GA	Army	FORT MCPHERSON	AZ	Marines	MARINE CORPS AIR STATION, YUMA
PA	Army	CHARLES E. KELLY SPT FAC	MI	Air Force	SELFRIDGE AGB
CA	Navy	NAVAL POSTGRADUATE SCHOOL	TX	Air Force	GOODFELLOW AFB
MI	Army	DETROIT ARSENAL	TX	Air Force	RANDOLPH AFB
MA	Army	SOLDIER SYSTEMS CENTER	CA	Marines	MC AIR STATION, CAMP PENDELTON
NY	Air Force	NIAGARA FALLS IAP ARS	CA	Air Force	LOS ANGELES AFB
CA	Air Force	ONIZUKA AS	SC	Air Force	CHARLESTON AFB
MD	Army	ADELPHI LABORATORY CENTER	MA	Air Force	WESTOVER ARB
TX	Army	FORT SAM HOUSTON	IL	Army	ROCK ISLAND ARSENAL
TX	Army	RED RIVER ARMY DEPOT	MA	Air Force	HANSCOM AFB
NJ	Navy	NAVAL AIR WARFARE CNTR DIV	NH	Navy	PORTSMOUTH NAVAL SHIPYARD
CA	Army	DEF DISTR REG WEST SHARPE	NV	Air Force	NELLIS AFB
CA	Army	DEF DISTR REG WEST TRACY	NM	Air Force	CANNON AFB
PA	Air Force	PITTSBURGH IAP ARS	FL	Navy	NAS, JACKSONVILLE

The full model provides realistic projections as it picked several bases which have been previously identified for closure or realignment including: Rock Island Arsenal, Fort Monmouth, Detroit Arsenal, Onizuka AS, Red River Army Depot, and the Naval Air Warfare Center Div in NJ. One base that made the list but likely would not close is the Naval Postgraduate School (NPS) located in Monterey, CA. The NPS has the mission of providing graduate level non-technical instruction leading to master degrees to Air Force and Naval officers. It was likely included among the top 20 bases with the highest probability for closure because its unique mission does not merit the political support that other bases require to survive. Because California representatives do not need to lobby hard to keep the NPS open, the projection model identifies it as a likely candidate. It is

hypothesized that the unique aspects of the NPS will ensure it remains open in future closure rounds.[65]

The Pentagon major base model also identifies bases that have been previously selected or seriously considered for closure or have experienced major realignments including: MacDill AFB, Brooks AFB, Scott AFB, L.A. AFB, and Rock Island Arsenal. MacDill AFB was closed by the Pentagon and the Commission during the 1991 closure but remained open due to the destruction of Homestead AFB. Facilities that the model identifies as candidates for closure but that are not likely to close due to the uniqueness of their mission include: Lackland AFB and Marine Corps Station Camp Pendleton (both recruit training bases) and Nellis AFB (due to the associated bombing range and advanced fighter training). It is hypothesized that the uniqueness of these three bases will largely protect them from any future closure efforts and that they made the projection list because limited political clout is required to ensure their survivability. The expected low values of their political variables is what made them strong candidates for closure by the projection model.

Similar projections were also made using the service specific sensitivity analysis models. The top 10 bases for each service are presented in table 27. Service sensitivity predictions that are the same as those from the full model or the Pentagon major base model are shaded grey.

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[65] The same reasoning can be developed for the Air Force Institute of Technology (AFIT) which provides Air Force and Navy officers with advanced technical degrees; however, the Air Force did strongly consider shutting down AFIT in 1997/1998 and sending officers to civilian universities to earn their degrees. In this light, it is not surprising to find the NPS on the top 20 list.

Table 27. Model 1 – Service Closure Projections

Air Force Sensitivity Model	
State	Base
OH	YNGSTWN-WAR REG APT ARS
TX	LACKLAND AFB
OH	TOLEDO EXPRESS APT AGS
TX	ELLINGTON FIELD AGS
FL	MACDILL AFB
MO	JEFFERSON BARRACKS AGS
OH	MANSFIELD LAHM MAP AGS
GA	DOBBINS ARB
GA	SAVANNAH IAP AGS
TX	DYESS AFB

Army Sensitivity Model	
State	Base
NJ	PICATINNY ARSENAL
CA	PRESIDIO MONTEREY
MI	U.S. ARMY GARRISON SELFRIDGE
MI	DETROIT ARSENAL
NY	WATERVLIET ARSENAL
NJ	FORT MONMOUTH
AR	MTA CAMP ROBINSON
AR	PINE BLUFF ARSENAL
GA	FORT MCPHERSON
MA	SOLDIER SYSTEMS CENTER

Navy Sensitivity Model	
State	Base
CA	NAVAL POSTGRADUATE SCHOOL
IL	NAVAL HOSPITAL GREAT LAKES
MD	US NAVAL ACADEMY
IL	GREAT LAKES NAVAL TRNG CNTR
WA	NAVAL HOSPITAL BREMERTON
IL	PWC GREAT LAKES
PA	NAS WILLOW GROVE
NC	NAVHOSP CAMP LEJEUNE
WA	FISC PUDGET SOUND BREMERTON
WA	NAVAL UNDERSEA WARFARE CNTR DIV

The results indicate that the full model does a good job predicting the Army bases that will likely close, a decent job predicting the Air Force Bases and not a very good job predicting the Navy bases that are candidates for closure. Much of this disparity can be attributed to the lack of a commission or mission variable in the prediction equation – both variables had large effects and were mostly associated with the Air Force and the Navy. Despite these limitations, the sensitivity models provide a way to account for the uniqueness of the services when they approached the closure process. Bases in Table 27 that will likely not close in the future due to uniqueness of mission include (shaded with a

pattern): Lackland AFB, NPS, and The U.S. Naval Academy. These facilities were likely selected because politicians do not invest a lot of political capital into bases that will likely remain open due to their unique mission. By not defending these bases, politicians are free to concentrate their political clout on other bases that are not as inherently protected or in non-defense related areas.

An appropriate way to interpret the projection results is to combine the overall model predictions with the sensitivity model projections to form a pool of bases that are likely closure targets.

Model 2

Projection results for model 2 were computed using the full model and the sensitivity analysis for the different services.[66] As in model 1, the 20 bases with the highest probability of closure for the full model and the top 10 bases for each service from the sensitivity models are presented. The projection results are listed in Tables 28 and 29.

Of the 20 bases listed in Table 28, 12 of them were also selected by model 1 as probable closures. The eight new observations are: Charles M. Price Spt Ctr, IL; Scott AFB, IL; Fitzsimons AMC, CO; Brooks AFB, TX; Hanscom AFB, MA; MacDill AFB, FL; Randolph AFB, TX; and Little Rock AFB, AR. Of these eight, five were previously selected by the Pentagon major base model (right side of table 26), leaving only three new observations – Charles M Price Spt Ctr, Fitzsimons AMC, and Little Rock, AFB.

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[66] The DoD defined major base model was not used because the results of this model were the same for both model 1 and model 2 – the same bases were projected to close whether or not guard and reserve bases were considered.

Model 2 also selected MacDill AFB, which had previously been closed by BRAC and the Naval Post Graduate School which will likely not be closed for the reasons mentioned earlier.

Table 28. Model 2 Closure Projections

Full Model		
State	**Service**	**Base**
CA	Army	PRESIDIO MONTEREY
CA	Air Force	ONIZUKA AS
IL	Army	ROCK ISLAND ARSENAL
NY	Army	WATERVLIET ARSENAL
PA	Army	CHARLES E. KELLY SPT FAC
CA	Navy	NAVAL POSTGRADUATE SCHOOL
MI	Army	U.S. ARMY GARRISON SELFRIDGE
IL	Army	CHARLES MELVIN PRICE SPT CTR
NJ	Army	FORT MONMOUTH
GA	Army	FORT MCPHERSON
MI	Army	DETROIT ARSENAL
IL	Air Force	SCOTT AFB
CO	Army	FITZSIMONS AMC
TX	Air Force	BROOKS AFB
MA	Army	SOLDIER SYSTEMS CENTER
MA	Air Force	HANSCOM AFB
NJ	Navy	NAVAL AIR WARFARE CNTR DIV
FL	Air Force	MACDILL AFB
TX	Air Force	RANDOLPH AFB
AR	Air Force	LITTLE ROCK AFB

Table 29 lists the service closure projections for model 2. Predictions that are the same as those from the full model or the Pentagon major base model are colored grey. Predictions that are not likely to close due to their unique mission are shaded with a pattern and include: West Point, the U.S. Naval Academy, the Marine Corps Recruit Depot, and Bases located at Pearl Harbor. The first three bases are central to recruitment

and training and the Pearl Harbor facilities have a high level of strategic importance due to their location in the Pacific.

Table 29. Model 2 – Service Closure Projections

Air Force Sensitivity Model	
State	**Base**
NE	OFFUTT AFB
ND	GRAND FORKS AFB
TX	DYESS AFB
ID	MOUNTAIN HOME AFB
TX	GOODFELLOW AFB
FL	MACDILL AFB
SD	ELLSWORTH AFB
FL	PATRICK AFB
SC	CHARLESTON AFB
AR	LITTLE ROCK AFB

Army Sensitivity Model	
State	**Base**
CA	PRESIDIO MONTEREY
NY	WATERVLIET ARSENAL
NJ	PICATINNY ARSENAL
NJ	FORT MONMOUTH
MI	U.S. ARMY GARRISON SELFRIDGE
MI	DETROIT ARSENAL
IL	CHARLES MELVIN PRICE SPT CTR
GA	FORT MCPHERSON
IL	ROCK ISLAND ARSENAL
NY	WEST POINT MIL RESERVATION

Navy Sensitivity Model	
State	**Base**
MD	US NAVAL ACADEMY
NC	NAVHOSP CAMO LEJEUNE
SC	MC RECRUIT DEPOT
SC	MC AIR STATION, BEAUFORT
HI	PEARL HARBOR NAVAL SHIPYARD
HI	FISC PEARL HARBOR
SC	NAVHOSP BRANCH CLINIC
HI	PWC PEARL HARBOR
ME	NAS, BRUNSWICK
HA	COMNAVBASE PEARL HARBOR

The results of the service specific projections indicate that model 2 does an excellent job predicting Army bases that will likely close, a good job predicting Air Force bases that will likely close, and a poor job predicting Navy bases likely to close. As in Model 1, the lack of a variable to account for commission and mission parameters likely explains a good deal of the disparity across services.

Summary of Findings

The sensitivity analysis work demonstrates that considering the base closure process from a macro view may lead to difficulties uncovering the variables of interest that each of the military services focused on when deciding which bases to close.

Table 30. Summary of Service Sensitivity Results

Var of Interest	Model 1 (All Bases)			Model 2 (Active Duty Only)		
	Air Force	Army	Navy	Air Force	Army	Navy
Acreage	-8.1 *	-0.6 *	-3.8	-12.5 *	-1.0	-3.7 **
Total DoD Personnel	7.9 *	-17.1 *	-0.3	-4.3	-14.8 **	0.3
Major Bases in State	2.4	1.0	0.3	-1.1	4.4	-7.7 *
Per Capita Def Spending	-27.0	-55.6 *	-21.9	-43.6	-68.5 *	20.7
State Delegation	-99.4	6132.7	-100.0 **	6.9 **	-5.0	13.1 *
Seanate Armed Serv	59.1	83.9	-68.0 *	395.0 *	38.8	-57.3 *
Senate Def Committee	33.6	-48.7	-15.1	393.2 *	-55.2	-41.0
Senate Majority	-2.7	-46.4 *	24.1	29.1	-48.0 *	74.0 *
Senate Seniority	-3.2	-2.8	1.2	-5.0	-4.2	5.3 *
House Armed Serv	-64.7 **	33.7	66.5	-79.5 *	38.4	109.9 **
Defense Contributions	-1.3	0.3	-2.9 *	-1.2	-0.3	-2.8 *
NSI	0.5	-1.2 *	-0.0	-1.0	-1.6 *	0.2
Commission Var	906.9 *	194.3	153.6	1022.1 *	512.8	264.6
Presidential Var	937.0 *	-43.1	-60.7 *	3358.0 *	-61.3 **	-58.9 *
Bases with Similiar Miss	0.2	-1.2	1.3	-0.9	-1.4	1.7 **
Mission Var	430.3 *	112.2	-56.1 **	372.2 *	128.5	-62.4 **
* = signficant at 0.10 or better (two-tailed z-test)						
** = significant at 0.10 or better (one-tailed z-test)						

It also demonstrated that there was a small amount of learning that occurred over the closure years and that the Pentagon did focus on closing major facilities with declining missions. None of these results could have been distinguished from the full models of Chapter 5. Quantitative results indicate that value is added to the models by stratifying the database and looking at unique individual service characteristics where possible. Table 30 lists the significant variables for each of the services and indicates what the

change in odds for closure is for a one unit increase in each variable. As discussed in detail in the chapter, each of the significant variables is theoretically consistent with the approaches used by the individual services to determine which bases are excess and which should be closed.

The second half of the chapter discussed a unique set of projections that is based on the results of the empirical work. The projections indicate that if the same process is followed in the future, the bases found in table 31 are most at risk for closure.

Table 31. Summary of Projected Closures

Combined Projection Database					
State	Service	Base	State	Service	Base
AR	Air Force	LITTLE ROCK AFB	MI	Army	DETROIT ARSENAL
AZ	Marines	MARINE CORPS AIR STATION, YUMA	MI	Air Force	SELFRIDGE AGB
CA	Army	PRESIDIO MONTEREY	NH	Navy	PORTSMOUTH NAVAL SHIPYARD
CA	Air Force	ONIZUKA AS	NJ	Army	FORT MONMOUTH
CA	Army	DEF DISTR REG WEST SHARPE	NJ	Navy	NAVAL AIR WARFARE CNTR DIV
CA	Army	DEF DISTR REG WEST TRACY	NM	Air Force	CANNON AFB
CA	Air Force	LOS ANGELES AFB	NY	Army	WATERVLIET ARSENAL
CO	Army	FITZSIMONS AMC	NY	Air Force	NIAGARA FALLS IAP ARS
FL	Air Force	MACDILL AFB	PA	Army	CHARLES E. KELLY SPT FAC
FL	Navy	NAS, JACKSONVILLE	PA	Air Force	PITTSBURGH IAP ARS
GA	Army	FORT MCPHERSON	SC	Air Force	CHARLESTON AFB
IL	Army	ROCK ISLAND ARSENAL	TX	Army	FORT SAM HOUSTON
IL	Army	CHARLES MELVIN PRICE SPT CTR	TX	Army	RED RIVER ARMY DEPOT
IL	Air Force	SCOTT AFB	TX	Army	FORT SAM HOUSTON
MA	Army	SOLDIER SYSTEMS CENTER	TX	Air Force	DYESS AFB
MA	Air Force	WESTOVER ARB	TX	Air Force	BROOKS AFB
MA	Air Force	HANSCOM AFB	TX	Air Force	GOODFELLOW AFB
MD	Army	ADELPHI LABORATORY CENTER	TX	Air Force	RANDOLPH AFB
MI	Army	U.S. ARMY GARRISON SELFRIDGE			

The projection results are a combination of the bases that were identified by the two full models and the Pentagon model for major bases. Bases that were identified by the projection model but have unique missions and are thus not likely to close have been

removed. It was shown that the full models did a good job projecting which Army and Air Force bases would likely close; however, the models were not very good at projecting which Navy bases were most at risk. For these reasons, it is beneficial to consider the specific sensitivity analysis conducted for each service. Table 32 lists the top bases that the individual service models predict would be most at risk for future closures.

Table 32. Summary of Service Specific Projected Closures

Air Force Sensitivity Model			
State	**Base**	**State**	**Base**
AR	LITTLE ROCK AFB	OH	YNGSTWN-WAR REG APT ARS
FL	MACDILL AFB	OH	TOLEDO EXPRESS APT AGS
FL	PATRICK AFB	OH	MANSFIELD LAHM MAP AGS
GA	DOBBINS ARB	SC	CHARLESTON AFB
GA	SAVANNAH IAP AGS	SD	ELLSWORTH AFB
ID	MOUNTAIN HOME AFB	TX	ELLINGTON FIELD AGS
MO	JEFFERSON BARRACKS AGS	TX	DYESS AFB
ND	GRAND FORKS AFB	TX	GOODFELLOW AFB
NE	OFFUTT AFB		
Navy Sensitivity Model		**Army Sensitivity Model**	
State	**Base**	**State**	**Base**
HI	PWC PEARL HARBOR	AR	MTA CAMP ROBINSON
IL	NAVAL HOSPITAL GREAT LAKES	AR	PINE BLUFF ARSENAL
IL	GREAT LAKES NAVAL TRNG CNTR	CA	PRESIDIO MONTEREY
IL	PWC GREAT LAKES	GA	FORT MCPHERSON
ME	NAS, BRUNSWICK	IL	CHARLES MELVIN PRICE SPT CTR
NC	NAVHOSP CAMP LEJEUNE	IL	ROCK ISLAND ARSENAL
PA	NAS WILLOW GROVE	MA	SOLDIER SYSTEMS CENTER
SC	MC AIR STATION, BEAUFORT	MI	U.S. ARMY GARRISON SELFRIDGE
SC	NAVHOSP BRANCH CLINIC	MI	DETROIT ARSENAL
WA	NAVAL HOSPITAL BREMERTON	NJ	PICATINNY ARSENAL
WA	FISC PUDGET SOUND BREMERTON	NJ	FORT MONMOUTH
WA	NAVAL UNDERSEA WARFARE CNTR	NY	WATERVLIET ARSENAL

If a process similar to BRAC is followed for the fiscal year 2005 base closure round, the projections in Tables 31 and 32 provide a good forecast of the bases most at risk considering current political variables. Local communities and state delegations who have bases on the projection list can work to change political variables over the next few

years to improve the odds their base remains open. They should also begin to make contingency plans on how to transition closed military infrastructure to productive uses in order to lessen the short term economic impact potentially caused by the loss of jobs and federal defense dollars.

Chapter 7. Conclusions and Areas for Further Research

> "Since it is the largest single item in the federal budget, since it contains so many discretionary funds, and since defense spending is so important to so many constituencies, it is perhaps the most highly politicized budgetary item recommended by the President." [67]
>
> Ethan Kapstein

Overview

Over the last several decades the application of economic principles to non-market processes has generated fruitful insights and results and has been recognized by social scientists as an acceptable approach to evaluating human action.[68] Specifically, the application of economic principles to politics provides a strong theoretical basis for evaluating the Base Closure and Realignment process from a political economy perspective. Anecdotal evidence leaves little doubt that political variables play significant roles when public funds are appropriated and expended. For example, several political variables worked against the Pentagon in the early 1980's to completely shut down the ability of the largest U.S. department to close major military bases. The BRAC process was successful at closing some of the military's excess facilities – something that could only be done when a measure of the political forces that had operated during the

[67] The Political Economy of National Security. Ethan B. Kapstein, p. 62, 1992.
[68] Recognition is most notably found in the award of the 1986 Nobel Prize in Economics to James Buchanan (George Mason University) for his work in Public Choice.

1980's was reduced. Despite a decrease in political forces, this work has demonstrated from a qualitative and quantitative perspective that political forces continued to play prominent roles under the "independent" BRAC commission format.

Two unique aspects of this work have extended past quantitative BRAC research. Specifically, quantitative results were used to place specific bounds on the influence of political forces during the BRAC years, and qualitative theory and quantitative results were used to project which military facilities will most likely be at risk for closure in fiscal year 2005.

Implication of Research Questions and Hypothesis

The impetus for this work was to test four specific research questions and their associated hypothesis. The first research objective was to explain political power shifts necessary for the formation of independent BRAC commissions. It was hypothesized that Congress gave up power to close bases for many reasons, including self-interested ones. An extensive public choice literature review was used to qualitatively discuss the self-interested aspects of economic and political actors and to discuss rent-seeking, special interests, logrolling, and bureaucratic interactions that lead Congress to delegate control over base closures to outside participants. The use of win-set analysis provided a self-interested and exogenous based explanation of how Congress took control of base closures from the Pentagon and then temporarily gave up that power to four independent commissions. It was shown that Congress was forced into base closure mode by the end of the cold war and that the closure process allowed for a measure of control and influence while providing a scapegoat for representatives who lost military facilities in

their districts or states. The win-set analysis demonstrated that political variables are important when dealing with public goods, public funds, and geographically elected representatives and that political variables were important in the BRAC process as the formation of independent commissions occurred because of rapid power shifts and not through erosion of rents over time.

The second research objective was to evaluate BRAC closure recommendations from an economic/mission efficiency perspective. It was hypothesized that many bases were selected for closure for predominately economic/mission reasons as the Pentagon stated these two criteria were the most important factors considered in closing any facility. The quantitative model in Chapter 5 demonstrated that non-political variables played important roles in considering which bases were closed. Specifically it was found that the size of the base, the number of bases in the state, the per-capita defense spending in the state, and the mission of the base were all significant in determining whether a base was closed. Two models were considered, one included all bases with more than 300 personnel (Model 1) and the other included only active duty bases with more than 300 personnel (Model 2). Economic/mission regression results for model 1 indicate that for every 1,000 acre increase in the size of a base there is a 1.9% decrease in the odds of a base closing, while each additional base in the state leads to a 1.9% increase in the odds of closure. Also, for each $1,000 of per-capita defense spending there is a 43.2% decrease in the odds a base is closed. For active duty bases, every 1,000 acre increase leads to a 3.0% decrease in the odds of closure while each major base in the state adds 1.9% to the odds of closure and each $1,000 increase in per-capita defense spending leads

to a 49.1% decrease in the odds of closure (see tables 11 and 17 in Chapter 5). These results conclusively indicate that economic and mission criteria were important in determining which facilities would be closed during the BRAC process.

The third research objective was to evaluate closure recommendations from a Public Choice perspective to identify the role political forces played in closure decisions. It was hypothesized that a significant number of facilities were closed for both economic and political reasons because bases are closely tied to local and state economies and defense PACs provide significant contributions to elected representatives. These ties lead to strong incentives for congressman to fight for military bases located in their districts. Regression results confirm the hypothesis by finding that several political variables were significant in determining whether a particular base remained open. Political variables of note include: state delegation, house majority, defense contributions, national security index score, and the commission variable. The commission had the largest impact on the odds of closure. For model 1 the commission increased the odds of closure by 383.9% and for model 2 bases it increased the odds by 472.1% (tables 14 and 19). The house majority variable decreased the odds of closure by 33.4% for all bases and 37.4% for active duty bases. The state delegation decreased the odds of closure by 99.7% or less and defense contributions decreased the odds of closure by 1.5% to 1.6% for each $1,000 of contributions. These results indicate that logrolling, rent-seeking, and special interests all influenced the closure process. By understanding the political forces at work in the base closure process, the Pentagon can more easily make closure recommendations that have the highest probably of succeeding given the current political climate.

Results of the logistic regressions in model 1 and model 2 were compared to a model that clustered the data by base to check for independence of observation problems. No problems were encountered. A comparison was also made to a model estimated using the Cox proportional hazard rate process to see what affect the time to closure had on political variables (Appendices 4 and 5). The hazard model allows a comparison between the results obtained here and previous quantitative analysis conducted on base closures (Bielling, 1996).

There was concern that the aggregate models of Chapter 5 masked learning over time and individual service approaches to closure. Sensitivity analysis was conducted by year of closure and military service to check for underlying variables of interest. Improved measures of fit were obtained and results indicate that there was learning by politicians as additional political variables became more highly significant in latter closure years compared to earlier years. Stratifying the database by service indicates that each branch of the military approached the process differently; taking advantage of their unique mission requirements and political clout to gain the best support possible. Sensitivity analysis also demonstrated that the Pentagon did attempt to close bases with declining missions despite the influence of a myriad of political forces.

The final research objective was to predict which bases are most likely to close in the future if the same or similar process is approved by Congress. It is hypothesized that the independent commission format will likely be used for future rounds that are authorized to begin in 2005. Applying a current database of military facilities and political variables to the regression results from Chapters 5 and 6 allows for timely

predictions concerning which facilities are most likely at risk for closure. Results of the projection work indicate that the models do a good job accounting for relevant variables as several bases projected for closure are bases that either the Pentagon recommended or the commission seriously considered for closure during BRAC years. Projection results by service indicate that generally both models do a good job of predicting which Army bases will likely close, a decent job predicting which Air Force bases will likely close, and a poor job of projecting which Navy facilities are most at risk. Sensitivity analysis confirms that treating the services differently provides a better indication of which bases are likely to be recommended by individual military departments. The projections (see Tables 31 and 32 of Chapter 6) enable communities who are most likely to suffer a future military base closure time to prepare efficient transition plans. Good transition plans will lead to less economic hardships for the community and will likely enable the development of the closed military facility into a profitable industrial or air park.

Areas for Further Research

The acronym BRAC refers to two vital parts of the military bases closure process – closures and realignments. The work in this dissertation has significantly expanded the qualitative and quantitative body of knowledge associated with the closure process to identify the political and economic forces that were likely important to the odds a particular base was closed. With the identification of relevant closure variables, further investigations to identify how political and economic variables effected the realignment process are appropriate. From a theoretical perspective, realignments are somewhat less political because the affected bases are not entirely closed; however, bases that decreased

in scope through realignment are likely to be good candidates for closure in the next round of military reductions. The closure analysis in this work provides a good indication of which variables are most important to consider when defining data collection efforts for realignment analysis. Future realignments will almost certainly be necessary in the face of future closures and redefined military missions caused by the global war on terrorism.

Another area of fruitful research is to look at base closures prior to BRAC to see which mission, economic, and political forces were most significant when there was not a commission overseeing the process. A comparison can then be made to the work here to see which variables were most important when dealing with "independent" commissions. Results of this comparison can then be interpolated to other areas in the government where independent commissions have been recommended. For example using independent commissions to overcome problems associated with over cost and behind schedule weapon systems procurements like the B-2 stealth bomber and the V-22 Osprey.

It is anticipated that effective independent commissions are not easily implemented because of the problems associated with surrendering significant amounts of power. The relinquishing of power is in many ways contrary to the self-interested notions that motivate high level decision makers. As shown in this work, exogenous forces were necessary to motivate past and current decision makers to consider closing significant amounts of military infrastructure. For these reasons, it is anticipated that independent commissions are not likely candidates to solve many of the government public good problems for which they have been recommended.

Final Thoughts

Military base closures are a reality that will be around as long as there are armed forces. It is inevitable that the U.S. will often find itself possessing too much military infrastructure as the armed forces are shaped to meet changing threats and missions. The economics of political economy demonstrate that self-interest as manifest through political variables will also be a constant in base closures due to the large immediate and long term monetary and political impact closures can potentially have. Realizing these difficulties, it seems prudent to suggest that all future closures will contain a measure of political posturing and political compromise. The key to effectively working through military base closures is designing a system that allows for the expression of preference intensities while accomplishing the goal of reducing unneeded and burdensome infrastructure. The BRAC process was not perfect; however, it did temper political variables while allowing them to have a noticeable impact. This subtle approach, combined with pressure from external forces, is what ultimately made it possible for self-interested individuals to relinquish power for a short period.

In the face of international terrorism the base closure process has been re-opened. If a new compromise approach to military base closures is not developed in the next few years, it is likely that the closure process of 2005 will closely resemble the BRAC years. In this case, the projections in this work provide a good first analysis for the communities and bases that will likely be on the front lines of the military base battlefield. It is a battle that no community or congressional representative wants to lose in a war that most certainly will occur.

References

References

Agresti, A. (1996) *An Introduction to Categorical Data Analysis.* New York: John Wiley & Sons, Inc.

Aranson, P. H. and Ordeshook, P. C. (1981) "Regulation, Redistribution, and Public Choice." *Public Choice* 37(1).

Arminger, G. (1995) *Specification and Estimation of Mean Structures: Regression Models.* In Handbook of Statistical Modeling for the Social and Behavioral Sciences. p. 77-183, New York: Plenum Press.

Arnold, R.D. (1979) *Congress and the Bureaucracy.* New Haven: Yale University Press.

Bielling, D.A. (1996) "Three Essays: Military Base Closures and Federal Spending." University of California at Irvine, Dissertation.

Blaug, M. (1986) *Economic History and the History of Economics.* New York: New York University Press.

Borck, R. (1996) "Ideology and Interest Groups." *Public Choice* 88: 147-160.

Buchanan, J. (1965) "Ethical Rules, Expected Values, and Large Numbers." *Ethics* 76: 1 – 13.

Buchanan, J. and Tullock, G. (1965) *The Calculus of Consent.* Ann Arbor: The University of Michigan Press.

Caplan, B. (1999) "The Austrian Search for Realistic Foundations." *Southern Economic Journal* 65: 823-838.

Cassata, D. (1995) "GOP Says Proposed Cuts Fail to Pass Muster." *Congressional Quarterly Weekly Report*, 4 March.

Census Bureau. (Various Years). *Statistical Abstract of the United States.* Washington D.C.: Government Printing Office.

Congressional Budget Office. (1996) *Closing Military Bases: An Interim Assessment.* Washington D.C., CBO.

Congressional Quarterly (1987, 1992, 1994, 1996) *Politics in America.* Washington D.C.: CQ Press.

Congressional Record. (Various Years: 1965-2001) Washington: Government Printing Office.

Crain, W.M. and Tollision, R. (1977) The Influence of Representation on Public Policy. *Journal of Legal Studies* 6: 355-361.

Department of Defense. (1963) *Department of Defense Annual Report for Fiscal Year 1962.* Washington: Government Printing Office.

Department of Defense. (1967) *Department of Defense Annual Report for Fiscal Year 1965.* Washington: Government Printing Office.

Department of Defense. (1988) *Base Realignments and Closures, Report of the Defense Secretary's Commission.* Washington: Government Printing Office.

Department of Defense. (Various Years) *Base Structure Report.* Washington D.C.: Government Printing Office.

Department of Defense. (1994) *Distribution of Personnel Report.* Available on line at: http://web1.whs.osd.mil/mmid/m02/fy94/m02city.htm

Department of Defense (1998) *The Report of the Department of Defense on Base Realignment and Closure.* Washington D.C.; Government Printing Office.

Downs, A. (1957) *An Economic Theory of Democracy.* New York: Harper and Row.

Evinger, W.R. (1991, 1995) *Directory of Military Bases in the U.S.* Phoenix, AZ: The Oryx Press.

Foldvary, F. (1994) *Public Goods and Private Communities.* Brookfield, VT: Edward Elgar Publishing Company.

Frank, R.H. (2000) *Microeconomics and Behavior, Fourth Edition.* Boston: Irwin McGraw-Hill.

Gansler, J. (1980) *The Defense Industry.* Cambridge: The MIT Press.

General Accounting Office. (1998) *Military Bases: Status of Prior Base Realignment and Closure Rounds.* Washington DC, GAO, (NSIAD-99-36).

Gottlieb, S. (1997) *Defense Addiction: Can America Kick the Habit?* Boulder, CO: Westview Press.

Greene, W.H. (2000) *Econometric Analysis, 4th Edition.* New Jersey: Prentice-Hall.

Hayes, P.L., Vallance, B.J., and Van Tassel, A.R. (1997) *American Defense Policy, Seventh Edition.* Baltimore, MD: The Johns Hopkins University Press.

Hayek, F. A. (1973) *Law, Legislation and Liberty.* Chicago: The University of Chicago Press.

Hellman, C. and Frye, A.V. (2001) *New Beginnings: How Base Closures Can Improve Local Economies and Transform America's Military.* Washington D.C.: Center for Defense Information.

Henry, D. and Oliver, R. (1987) "The Defense Buildup, 1977-1985: The Effects on Production and Unemployment." *Monthly Labor Review*, August: 3-11.

Hinich, M.J. and Munger, M.C. (1997) *Analytical Politics.* Cambridge: Cambridge University Press.

Hoffman, E. and Spitzer, M. L. (1986) "Experimental Tests of the Coase Theorem with Large Bargaining Groups." *Journal of Legal Studies* 15: 149 -171.

Holcombe, R.G. (1997) "A Theory of the Theory of Public Goods," *Review of Austrian Economics* 10: 1-22.

Hosmer, D.W. and Lemeshow, S. (2000) *Applied Logistic Regression: Second Edition.* New York: John Wiley and Sons, Inc.

Idelson, H. and Towell, P. (1994) "House and Supreme Court Take Hands-off Stance." *Congressional Quarterly Weekly Report*, 28 May.

Jaccard, J. (2001) *Interaction Effects In Logistic Regression.* Thousand Oaks, CA: Sage Publications Inc.

Kahneman, D. and Tversky, A. (1981) "The Framing of Decisions and the Psychology of Choice." *Science* 211: 453-458.

Kapstein, E.B. (1992) *The Political Economy of National Security: A Global Perspective.* Columbia: University of South Carolina Press.

Kennedy, G. (1975) *The Economics of Defence*. Totowa, N.J.: Towman and Littlefield.

Long, J.S. (1997) *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage Publications.

Long, J.S. and Freese, J. (2001) *Regression Models for Categorical Dependent Variables Using Stata*. College Station, TX: Stata Press.

Makinson, L. (1990, 1992, 1994, 1996) *Open Secrets: The Dollar Power of PACs in Congress*. Washington D.C.: CQ Press.

Markusen, A. and Yudken, J. (1992) *Dismantling the Cold War Economy*. New York: Basic Books.

Mayer, K.R. (1992) *The Political Economy of Military Spending in the United States.* "Elections, Business Cycles, and the Timing of Defense Contract Awards in the United States." New York: Routledge.

Mehay, S. and Solnick, L. (1990) "Defense Spending and State Economic Growth." *Journal of Regional Science* 30: 477-487.

Mintz, A. (1992) *The Political Economy of Military Spending in the United States*. New York: Routledge.

Mises, L.V. (1949) *Human Action: A Treatise on Economics*. Yale University Press.

Mueller, D. C. (1989) *Public Choice II*. United Kingdom: Cambridge University Press.

National Journal. (1988, 1992, 1994, 1996) The Almanac of American Politics. New York: R.R. Donnelley & Sons Company.

Neter, J., et al. (1996) *Applied Linear Regression Models: Third Edition*. Chicago: Irwin Publishers.

Nicholson, W. (1998) *Microeconomic Theory: Basic Principles and Extensions, Seventh Edition*. The Dryden Press: Harcourt Brace College Publishers.

Niskanen, W. (1971) *Bureaucracy and Representative Government.* Chicago: Aldine-Atherton.

Olson. M. (1965) *The Logic of Collective Action.* Cambridge: Harvard University Press.

Olson. M. (1982) *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities.* New Haven: Yale University Press.

Palmer, E. (1991) "Base Closings: Bush Approves Panel's List, Dashing Members' Hopes." *Congressional Quarterly Weekly Report*, 13 July.

Pascall G.R. and Lamson, R.D. (1991) *Beyond Guns and Butter.* McLean, VA: Brassey's Inc.

Pigou, A. C. (1920) *The Economics of Welfare.* London: Macmillan (revised 1924, 1929, 1932).

Poppert, P.E. (2001) *Base Closure Impacts and the General Effects of Military Installations on Local Private Employment.* Dissertation: The University of Tennessee at Knoxville.

Prasch, R.E. (1996) "The Origins of the A Priori Method in Classical Political Economy: A Reinterpretation." *Journal of Economic Issues* 30: 1105-1125.

Rabe-Hesketh, S, and Everitt, B.S (1999) *A Handbook of Statistical Analysis using Stata.* Boca Raton, FL: CRC Press LLC.

Robinson, B. (2001) "Bureaucratic inefficiency: Failure to capture the efficiencies of outsourcing." *Public Choice* 107: 253-270.

Rowley, C.K, Tollison, R.D. and Tullock, G. (1988) *The Political Economy of Rent-Seeking.* Boston, MA: Kluwer Academic Publishers.

Sandler, T. and Hartley, K. (1995) *The Economics of Defense.* Cambridge: Cambridge University Press.

Samuelson, P. (1954) "The Pure Theory of Public Expenditures." *Review of Economics and Statistics* 36: 387-389.

Say, J.B. (1821) *A Treatise on Political Economy: or, The Production, Distribution, and Consumption of Wealth.* New York: A.M. Kelley, reprint of 1880 ed, 1971.

Senior, N. (1836) *An Outline of the Science of Political Economy.* Reprint. London: Allen and Unwin, 1938.

Sharp, M. (1997) *Directory of Congressional Voting Scores and Interest Group Ratings: Second Edition.* Washington D.C.: CQ Press.

Shmanske, S. (1991) *Public Goods, Mixed Goods, and Monopolistic Competition.* College Station: Texas A&M University Press.

Siehl, G.H. and Knight, E. (1996) "Military Base Closures Since 1988: Status and Employment Changes at the Community and State Level." Washington D.C.: Congressional Research Service.

Smith, A. (1776) *An Inquiry into the Nature and the Causes of the Wealth of Nations.* Edinburgh, 1843 edition.

Sorenson, D.S. (1998) *Shutting Down The Cold War: The Politics of Military Base Closure.* New York: St. Martin's Press.

Statacorp. (2001) *Stata Statistical Software: Release 7.0.* College Station, TX: Stata Corporation.

Stratmann, T (1992) "The Effects of Logrolling on Congressional Voting." *The American Economic Review* 82: 1162-1176.

Stroup, M.D. (1998) "Some Evidence of Congressional Political Markets in DoD Personnel Allocations Across State." *Public Choice* 94: 241-254.

Tapp, C.S. (2001) *BRAC to the Future: An Analysis of Past Savings from Base Closings.* Master's Thesis: The Air Force Institute of Technology.

Tiebout, C. M. (1956) "A Pure Theory of Local Expenditures." *Journal of Political Economy* 64: 416-424.

Tollison, R.D. (1997) *Chapter 23 in Perspectives on Public Choice: a Handbook.* Edited by Dennis C. Mueller. Cambridge University Press.

Tridimas, G. (2001) "The Economics and Politics of the structure of public expenditure." *Public Choice* 106: 299-316.

Tufte, E.R. (1978) *Political Control of the Economy.* Princeton, NJ: Princeton University Press.

Tullock, G. (1965) *The Politics of Bureaucracy.* Washington D.C.: The Public Affairs Press.

Tullock, G. (1967) "The Welfare Costs of Tariffs, Monopolies, and Theft." *Western Economic Journal* 5: 224-232.

Tullock, G. (1975) "The Transitional Gains Trap." *The Bell Journal of Economics and Management Science* 6: 671-678.

Tullock, G. (1976) *The Vote Motive.* London: Institute of Economic Affairs.

Twight, C. (1989) "Institutional Underpinnings of Parochialism: The Case of Military Base Closures." *CATO Journal* 5.

U.S. General Services Administration. (1984) *Detailed listing of real property owned by the United States and used by the Department of Defense for military functions throughout the world as of September 30, 1983.* Washington D.C.: Government Printing Office.

Verbeek, M. (2000) A *Guide to Modern Econometrics.* Great Britain: Antony Rowe, Chippenham, Wiltshire.

Weingast, B.R. (1984) "The Congressional-Bureaucratic System: A Principal Agent Perspective." *Public Choice* 44.

Weingast, B and Moran, M. J. (1983) "Bureaucratic Discretion or Congressional Control? Regulatory Policymaking by the Federal Trade Commission." *Journal of Political Economy* 91: 765 – 800.

Weston, R.L. (1998) *Carroll's Military Facilities Directory.* Washington D.C.: Carroll Publishing.

Whately, R. (1832) *Introductory Lectures on Political Economy.* Reprint. New York: Augustus M. Kelley, 1966.

Zycher, B. (1993) "Defense." The Fortune Encyclopedia of Economics edited by David R. Henderson. Warner Books, Inc: 661-667.

Appendix

Appendix 1 – Bases in the Primary Database

Alabama
Anniston Army Depot
Birmingham IAP AGS
Dannelly Field AGS
Fort McClellan
Fort Rucker
Gunter AFS
Maxwell AFB
Redstone Arsenal

Alaska
Eareckson AFS/Shemya AFB
Eielson AFB
Elmendorf AFB
Fort Greely
Fort Richardson
Fort Wainwright
Galena Airport AFS
Kulis Air Guard Station
Naval Air Facility, Adak
Naval Security Group Activity

Arizona
Davis-Monthan AFB
Fort Huachuca
Luke AFB
Marine Corps Air Station, Yuma
Phoenix Sky Harbor IAP AGS
Tucson IAP AGS
Williams AFB
Yuma Proving Ground

Arkansas
Eaker AFB
Fort Chaffee
Fort Smith Regional Apt AGS
Little Rock AFB
Pine Bluff Arsenal

California
Beale AFB
Castle AFB

California (cont)
Def Distr Reg West Sharpe
Def Distr Reg West Tracy
Edwards AFB
FISC, Oakland
Fleet & Industrial Supply Center
Fleet ASW Training Ctr, Pac
Fleet Combat Tng Ctr, Pac
Fort Hunter Liggett
Fort Ord
Fresno Air Terminal AGS
George AFB
Long Beach Naval Shipyard
Los Angeles AFB
March AFB
Mare Island Naval Shipyard
Mather AFB
MC Air Ground Combat Ctr 29 Palms
MC Air Station, Camp Pendelton
MC Air Station, El Toro
MC Air Station, Tustin
MC Base, Camp Pendleton
MC Logistics Base, Barstow
MC Recruit Depot, San Diego
McClellan AFB
NAS, Alameda
NAS, Lemoore
NAS, Miramar
NAS, Moffett Field
NAS, North Island
NAV Const Bn Ctr, Pt Hueneme
NAV Sub Base, San Diego
Naval Air Fac, El Centro
NAWC, Weapons Div
Naval Air Warfare Cntr Weapons Div
Naval Amphib Base, Coronado
Naval Aviation Depot Alameda
Naval Aviation Depot, North Island
Naval Comm Sta, Stockton

California (cont)
Naval (NCCOSC) RDT&E Div
Naval Computer & Telcomm, San Diego
Naval Hosp, Camp Pendelton
Naval Hospital, Oakland
Naval Postgraduate School
Naval Station Treasure Island
Naval Station, Long Beach
Naval Station, Mare Island
Naval Station, San Diego
Naval Tng Ctr, San Diego
Naval Weapons Sta, Concord
NAVMEDCEN San Diego
NISE West
Norton AFB
NTC and Fort Irwin
Oakland Army Base
Onizuka AS
Presidio Monterey
Presidio San Francisco
Sacramento Army Depot
Sierra Army Depot
Travis AFB
Van Nuys Airport AGS
Vandenberg AFB
Weapons Station, Seal Beach

Colorado
Buckley AGB
Cheyenne Mountain
Falcon AFB
Fitzsimons AMC
Fort Carson
Lowry AFB
Peterson AFB
Pueblo Depot Act
USAF Academy

Connecticut
Bradley IAP AGS
Naval Sub Base, New London

Delaware
Dover AFB

Florida
Avon Park AFS
Cape Canaveral AS
Coastal Systems Station
Eglin AFB
Homestead AFB
Hurlburt Field
Jacksonville IAP AGS
MacDill AFB
NAS, Cecil Field
NAS, Jacksonville
NAS, Key West
NAS, Pensacola
NAS, Whiting Field
NAV Ed & Tng Pro Mgmt Sup Act
NAV Tech Tng Ctr, Corry Sta
Naval Aviation Depot JAX
Naval Aviation Depot Pensacola
Naval OLF Saufley
Naval Station, Mayport
Naval Training Center
Patrick AFB
Tyndall AFB

Georgia
Dobbins ARB
Fort Benning
Fort Gillem
Fort Gordon
Fort McPherson
Fort Stewart
Hunter Army Airfield
MC Logistics Base ICP
Moody AFB
NAS, Atlanta
Naval Sub Base, Kings Bay

Georgia (cont)
Navy Supply Corps School
Robins AFB
Savannah IAP AGS

Hawaii
Camp Smith
Fort Derussy
Fort Shafter
Helemano Radio Station
Hickam AFB
Kunia Field Station
MCAS, Kaneohe Bay
NAS, Barbers Point
Naval Computer & Telecomm
Naval Magazine Lualualei
Naval Public Works Center
Naval Station, Pearl Harbor
Naval Sub Base, Pearl Harbor
Naval Supply Center, Pearl Harbor
Pearl Harbor Naval Shipyard
Schofield Barracks Military Res
Tripler Army Medical Center
Wheeler AFB

Idaho
Boise Air Terminal AGS
Mountain Home AFB

Illinois
Capital Airport AGS
Chanute AFB
Charles Melvin Price Spt Ctr
Chicago-O'hare IAP ARS
Ft Sheridan
Great Lakes Naval Trng Cntr
NAS Glenview
Naval Hospital, Great Lakes
Navy Public Works Ctr, Great Lakes
Rock Island Arsenal
Savanna Depot Activity
Scott AFB

Indiana
Crane Div, NAV Surf Warfare Cntr
Fort Benjamin Harrison
Fort Wayne IAP AGS
Grissom AFB
Hulman Regional Airport AGS
Jefferson Proving Ground
Naval Air Warfare Cntr, Aircraft Div

Iowa
Des Moines IAP AGS

Kansas
Forbes Field AGS
Fort Leavenworth
Fort Riley
McConnell AFB

Kentucky
Bluegrass Army Depot Activity
Fort Campbell
Fort Knox
Lexington Blue Grass Army Depot
Louisville IAP AGS
Naval Surface Warfare Center

Louisiana
Barksdale AFB
England AFB
Fort Polk
NAS New Orleans /Joint Reserve
NAV Supt Act New Orleans

Maine
Bangor IAP AGS
Loring AFB
NAS Brunswick
NAV Security Group Activity

Maryland
Aberdeen Proving Ground
Adelphi Laboratory Center
Andrews AFB
Carderock Division, NAV Surf War Ctr

Maryland (cont)
Fort Detrick
Fort Meade
Fort Ritchie
Martin State AGS
National Naval Med Center
NAV Surf Warfare Cntr, Indian Hd
NAVAIR Warfare Cntr Aircraft Div
Naval Surface Warfare Center
NAVCOMM Det Cheltenham
US Naval Academy

Massachusetts
Barnes MAP AGS
Fort Devens
Hanscom AFB
Materials & Mechanical Research Ctr
NAS South Weymouth
Natick Res Dev & Eng Center
Otis AGB
Westover ARB

Michigan
Detroit Arsenal
K.I. Sawyer AFB
Selfridge AGB
W. K. Kellogg Airport AGS
Wurtsmith AFB

Minnesota
Duluth IAP AGS
Minneapolis-St Paul IAP ARS
Twin Cities AAP

Mississippi
Columbus AFB
Jackson IAP AGS
Keesler AFB
Key Field AGS
NAS Meridian
NAV Const Bn Ctr, Gulfport
NAV Meteorology & Oceanography
Naval Station Pascagoula

Missouri
Fort Leonard Wood
Lake City AAP
Lambert-St Louis IAP AGS
Richards-Gebaur AFB
Whiteman AFB

Montana
Great Falls IAP AGS
Malmstrom AFB

Nebraska
Lincoln MAP AGS
Offutt AFB

Nevada
Indian Springs AFS
NAS Fallon
Nellis AFB
Reno-Tahoe IAP AGS

New Hampshire
Pease AFB
Portsmouth Naval Shipyard

New Jersey
Atlantic City IAP AGS
Fort Dix
Fort Monmouth
McGuire AFB
Mil Ocean Terminal Bayonne
Naval Air Propulsion Center
Naval Air Warfare Cntr Div Lakehurst
Naval Weapons Station, Earle
Picatinny Arsenal

New Mexico
Cannon AFB
Holloman AFB
Kirtland AFB
White Sands Missile Range

New York
Fort Drum
Fort Hamilton

New York (cont)
Griffiss AFB
Hancock Field AGS
Naval Station, New York
Naval Station, Staten Island
Niagara Falls IAP ARS
Plattsburgh AFB
Seneca Army Depot
Watervliet Arsenal
West Point Mil Reservation

North Carolina
Charlotte/Douglas IAP AGS
Fort Bragg
MC Air Station, Cherry Point
MC Base, Camp Lejeune
Mil Ocean Terminal Sunny Point
Pope AFB
Seymour Johnson AFB

North Dakota
Grand Forks AFB
Hector IAP AGS
Minot AFB

Ohio
Def Construction Support Center
Finance Center
Gentile AFB
Newark AFB
Rickenbacker IAP AGS
Springfield-Beckley MAP AGS
Wright-Patterson AFB
Youngstown-Warren Regnl Apt ARS

Okalahoma
Altus AFB
Fort Sill
McAlester AAP
Tinker AFB
Tulsa IAP AGS
Vance AFB
Will Rogers World Airport AGS

Oregon
Kingsley Field AGS
Portland IAP AGS

Pennsylvania
Carlisle Barracks
Charles E. Kelly Support Fac
Def Personnel Support Ctr
Defense Distrib Region East
Fort Indiantown Gap
Greater Pittsburgh ANG Base
Harrisburg IAP AGS
Letterkenny Army Depot
NAS Joint Reserve Base
Naval Air Warfare Cntr Aircraft Div
Naval Hospital, Philadelphia
Naval Station Philadelphia
Navy Aviation Supply Office
Navy Ships Parts Control Ctr
Philadelphia Naval Shipyard
Pittsburgh IAP ARS
Tobyhanna Army Depot

Rhode Island
NAV Education & Training Ctr
Naval Hospital, Newport
Naval Undersea Warfare Ctr, Div

South Carolina
Beaufort Naval Hospital
Charleston AFB
Charleston Naval Shipyard
Fort Jackson
MC Air Station, Beaufort
MC Recruit Depot
McEntire AGS
Myrtle Beach AFB
NAV Weapons Station, Charleston
Naval Hospital, Charleston
Naval Station Charleston
Naval Supply Center, Charleston
Shaw AFB

South Dakota
Ellsworth AFB
Joe Foss Field AGS

Tennessee
Arnold AFB
Defense Depot Memphis
McGhee Tyson Apt AGS
NAS Memphis
Nashville IAP AGS
Naval Hospital, Millington

Texas
Bergstrom AFB
Brooks AFB
Camp Bullis
Carswell AFB
Corpus Christi Army Depot
Dyess AFB
Ellington Field AGS
Fort Bliss
Fort Hood
Fort Sam Houston
Goodfellow AFB
Kelly AFB
Lackland AFB
Laughlin AFB
NAS Chase Field
NAS Corpus Christi
NAS Dallas
NAS Kingsville
Naval Hospital, Corpus Christi
NS Ingleside
Randolph AFB
Red River Army Depot
Reese AFB
Sheppard AFB

Utah
Defense Dist Depot Ogden
Dugway Proving Ground
Fort Douglas
Hill AFB

Utah (cont)
Salt Lake City IAP AGS
Tooele Army Depot

Vermont
Burlington IAP AGS

Virginia
Arlington Hall
Cameron Station
Camp Elmore
Defense Gen Supply Center
FCTCLANT Dam Neck
Fort A P Hill
Fort Belvoir
Fort Eustis
Fort Lee
Fort Monroe
Fort Myer
Fort Pickett
Fort Story
HQMC, Henderson Hall
Langley AFB
MC Combat Dev Command
NACCOMM Area Master Sta Lant
NAS Norfolk
NAS Oceana
NAV Amphib Base, Little Creek
NAV Security Grp Activity, Northwest
Naval Med Cntr
Naval Station, Norfolk
Naval Surface Warfare Cntr
Naval Weapons Sta, Yorktown
Norfolk Depot
Norfolk Naval Shipyard
Richmond IAP AGS
Vint Hill Farms Station

Washington
Fairchild AFB
Fort Lewis
McChord AFB
NAS Whidbey Island

Washington (cont)

Naval Station Everett

Naval Station, Puget Sound

Naval Submarine Base, Bangor

Naval Supply Ctr, Pudget Sound

Naval Undersea Warfare Cntr Div

Puget Sound Naval Shipyard

West Virginia

EWVR/Shepherd Fld AGS

Wisconsin

Dane County Regional-Truax Field AGS

Fort McCoy

General Mitchell IAP ARS

Wyoming

Cheyenne Airport AGS

Frances E. Warren AFB

Appendix 2 – Raw Data for Per Capita Defense Spending

Population Figures used in the Empirical Model

State	1987	1990	1992	1994
Alabama	4,015,000	4,040,000	4,131,000	4,219,000
Alaska	539,000	550,000	587,000	606,000
Arizona	3,437,000	3,665,000	3,835,000	4,075,000
Arkansas	2,342,000	2,351,000	2,395,000	2,453,000
California	27,777,000	29,758,000	30,909,000	31,431,000
Colorado	3,260,000	3,294,000	3,463,000	3,656,000
Connecticut	3,247,000	3,287,000	3,279,000	3,275,000
Delaware	637,000	666,000	690,000	706,000
Florida	11,997,000	12,938,000	13,510,000	13,953,000
Georgia	6,208,000	6,478,000	6,765,000	7,055,000
Hawaii	1,068,000	1,108,000	1,153,000	1,179,000
Idaho	985,000	1,007,000	1,066,000	1,133,000
Illinois	11,391,000	11,431,000	11,610,000	11,752,000
Indiana	5,473,000	5,544,000	5,652,000	5,752,000
Iowa	2,767,000	2,777,000	2,808,000	2,829,000
Kansas	2,445,000	2,478,000	2,518,000	2,554,000
Kentucky	3,683,000	3,687,000	3,753,000	3,827,000
Louisiana	4,344,000	4,220,000	4,273,000	4,315,000
Maine	1,185,000	1,228,000	1,237,000	1,240,000
Maryland	4,566,000	4,781,000	4,914,000	5,006,000
Massachusetts	5,935,000	6,016,000	5,999,000	6,041,000
Michigan	9,187,000	9,295,000	9,423,000	9,496,000
Minnesota	4,235,000	4,376,000	4,474,000	4,567,000
Mississippi	2,589,000	2,575,000	2,613,000	2,669,000
Missouri	5,057,000	5,117,000	5,193,000	5,278,000
Montana	805,000	799,000	823,000	856,000
Nebraska	1,567,000	1,578,000	1,604,000	1,623,000
Nevada	1,023,000	1,202,000	1,331,000	1,457,000
New Hampshire	1,054,000	1,109,000	1,114,000	1,137,000
New Jersey	7,671,000	7,730,000	7,813,000	7,904,000
New Mexico	1,479,000	1,515,000	1,581,000	1,654,000
New York	17,869,000	17,991,000	18,095,000	18,169,000
North Carolina	6,404,000	6,632,000	6,838,000	7,070,000
North Dakota	661,000	639,000	635,000	638,000
Ohio	10,760,000	10,847,000	11,005,000	11,102,000
Oklahoma	3,210,000	3,146,000	3,206,000	3,258,000
Oregon	2,701,000	2,842,000	2,975,000	3,086,000
Pennsylvania	11,811,000	11,883,000	11,990,000	12,052,000
Rhode Island	990,000	1,003,000	1,002,000	997,000
South Carolina	3,381,000	3,486,000	3,595,000	3,664,000
South Dakota	696,000	696,000	709,000	721,000
Tennessee	4,783,000	4,877,000	5,021,000	5,175,000
Texas	16,622,000	16,986,000	17,667,000	18,378,000
Utah	1,678,000	1,723,000	1,811,000	1,908,000
Vermont	540,000	563,000	571,000	580,000
Virginia	5,932,000	6,189,000	6,389,000	6,552,000
Washington	4,532,000	4,867,000	5,146,000	5,343,000
West Virginia	1,858,000	1,793,000	1,807,000	1,822,000
Wisconsin	4,778,000	4,892,000	4,997,000	5,082,000
Wyoming	477,000	454,000	464,000	476,000

***Source - U.S. Census Bureau, Table 27, Resident Population - States**

Defense Spending Figures used in the Empirical Model

State	Defense Spending 1987	Defense Spending 1990	Defense Spending 1992	Defense Spending 1994
Alabama	2,962,000,000	3,927,000,000	4,088,000,000	3,993,000,000
Alaska	1,159,000,000	1,463,000,000	1,574,000,000	1,550,000,000
Arizona	4,004,000,000	4,169,000,000	3,604,000,000	3,617,000,000
Arkansas	1,060,000,000	1,024,000,000	991,000,000	1,075,000,000
California	34,083,000,000	38,217,000,000	38,045,000,000	36,040,000,000
Colorado	3,806,000,000	4,836,000,000	4,661,000,000	4,918,000,000
Connecticut	5,450,000,000	5,638,000,000	3,719,000,000	3,071,000,000
Delaware	330,000,000	395,000,000	370,000,000	393,000,000
Florida	9,420,000,000	11,169,000,000	11,272,000,000	12,074,000,000
Georgia	5,757,000,000	5,777,000,000	8,030,000,000	8,394,000,000
Hawaii	2,218,000,000	2,942,000,000	2,965,000,000	3,220,000,000
Idaho	214,000,000	360,000,000	356,000,000	381,000,000
Illinois	3,264,000,000	3,628,000,000	3,129,000,000	3,066,000,000
Indiana	2,796,000,000	3,233,000,000	2,612,000,000	2,489,000,000
Iowa	654,000,000	663,000,000	644,000,000	545,000,000
Kansas	1,936,000,000	2,102,000,000	2,041,000,000	1,846,000,000
Kentucky	1,545,000,000	2,398,000,000	2,280,000,000	2,671,000,000
Louisiana	2,415,000,000	2,660,000,000	2,562,000,000	3,503,000,000
Maine	1,263,000,000	1,732,000,000	1,949,000,000	1,509,000,000
Maryland	6,855,000,000	7,400,000,000	7,272,000,000	7,564,000,000
Massachusetts	9,226,000,000	7,949,000,000	6,679,000,000	6,187,000,000
Michigan	2,416,000,000	2,264,000,000	2,472,000,000	2,480,000,000
Minnesota	2,528,000,000	2,143,000,000	1,854,000,000	1,540,000,000
Mississippi	2,164,000,000	2,854,000,000	3,646,000,000	3,101,000,000
Missouri	6,859,000,000	7,854,000,000	5,336,000,000	7,713,000,000
Montana	198,000,000	314,000,000	288,000,000	321,000,000
Nebraska	668,000,000	938,000,000	971,000,000	922,000,000
Nevada	476,000,000	844,000,000	846,000,000	917,000,000
New Hampshire	602,000,000	646,000,000	643,000,000	605,000,000
New Jersey	4,468,000,000	5,127,000,000	4,920,000,000	4,558,000,000
New Mexico	1,219,000,000	1,681,000,000	1,747,000,000	1,714,000,000
New York	10,618,000,000	8,727,000,000	7,240,000,000	5,523,000,000
North Carolina	3,554,000,000	5,335,000,000	5,581,000,000	5,349,000,000
North Dakota	404,000,000	481,000,000	474,000,000	460,000,000
Ohio	5,842,000,000	6,885,000,000	5,215,000,000	5,181,000,000
Oklahoma	1,913,000,000	2,672,000,000	2,794,000,000	2,774,000,000
Oregon	405,000,000	748,000,000	638,000,000	627,000,000
Pennsylvania	5,539,000,000	5,638,000,000	5,670,000,000	5,406,000,000
Rhode Island	747,000,000	835,000,000	892,000,000	858,000,000
South Carolina	2,261,000,000	3,607,000,000	3,455,000,000	3,527,000,000
South Dakota	222,000,000	397,000,000	337,000,000	326,000,000
Tennessee	1,375,000,000	3,003,000,000	2,246,000,000	2,241,000,000
Texas	13,035,000,000	17,483,000,000	15,688,000,000	15,346,000,000
Utah	1,904,000,000	1,828,000,000	1,666,000,000	1,427,000,000
Vermont	132,000,000	152,000,000	139,000,000	151,000,000
Virginia	15,023,000,000	17,288,000,000	17,728,000,000	19,500,000,000
Washington	4,992,000,000	4,969,000,000	5,522,000,000	5,277,000,000
West Virginia	208,000,000	358,000,000	288,000,000	400,000,000
Wisconsin	1,058,000,000	1,395,000,000	1,334,000,000	1,194,000,000
Wyoming	150,000,000	236,000,000	232,000,000	245,000,000

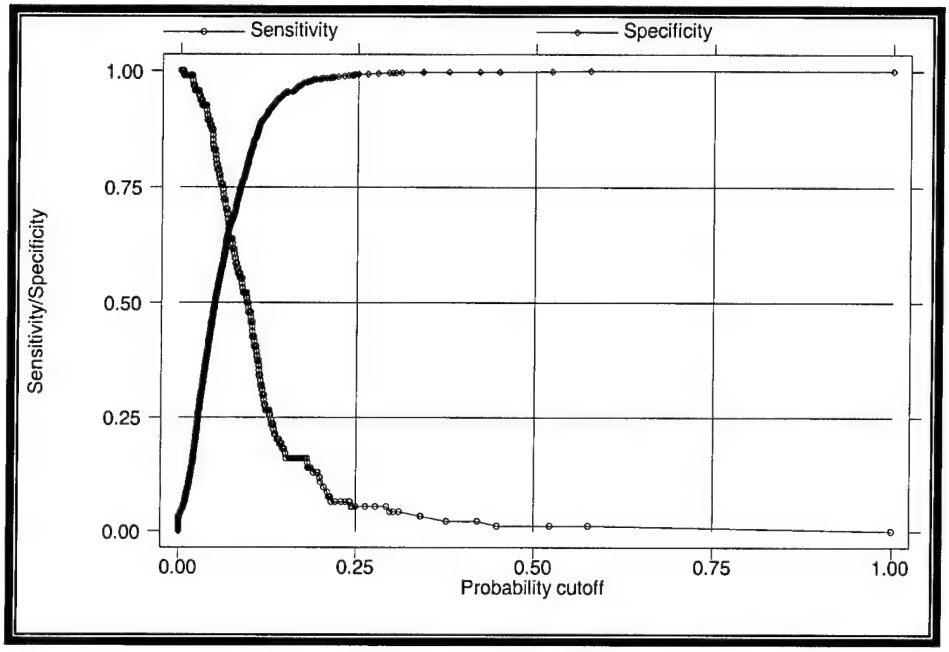
***Source: Statistical Abstract of the United States - U.S. Census Bureau**

Appendix 3 – State Delegation Raw Figures

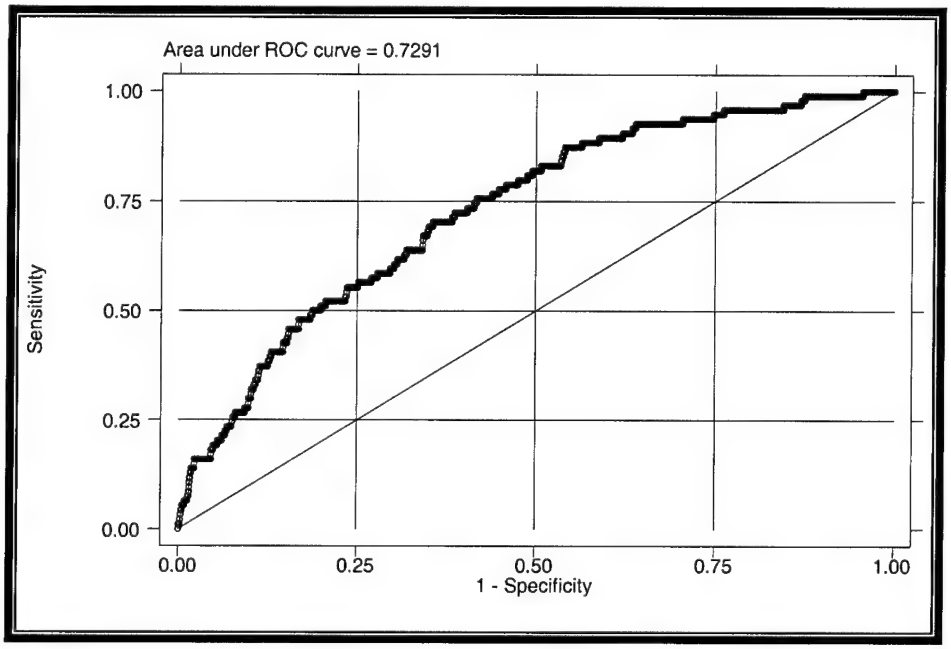
State Delegation Numbers (Electoral College)		
State	**BRAC 88 & 91 (1981-1990)**	**BRAC 93 & 95 (1991-2000)**
Alabama	9	9
Alaska	3	3
Arizona	7	8
Arkansas	6	6
California	47	54
Colorado	8	8
Connecticut	8	8
Delaware	3	3
Florida	21	25
Georgia	12	13
Hawaii	4	4
Idaho	4	4
Illinois	24	22
Indiana	12	12
Iowa	8	7
Kansas	7	6
Kentucky	9	8
Louisiana	10	9
Maine	4	4
Maryland	10	10
Massachusetts	13	12
Michigan	20	18
Minnesota	10	10
Mississippi	7	7
Missouri	11	11
Montana	4	3
Nebraska	5	5
Nevada	4	4
New Hampshire	4	4
New Jersey	16	15
New Mexico	5	5
New York	36	33
North Carolina	13	14
North Dakota	3	3
Ohio	23	21
Oklahoma	8	8
Oregon	7	7
Pennsylvania	25	23
Rhode Island	4	4
South Carolina	8	8
South Dakota	3	3
Tennessee	11	11
Texas	29	32
Utah	5	5
Vermont	3	3
Virginia	12	13
Washington	10	11
West Virginia	6	5
Wisconsin	11	11
Wyoming	3	3

Appendix 4 – Model 1 Regression Results

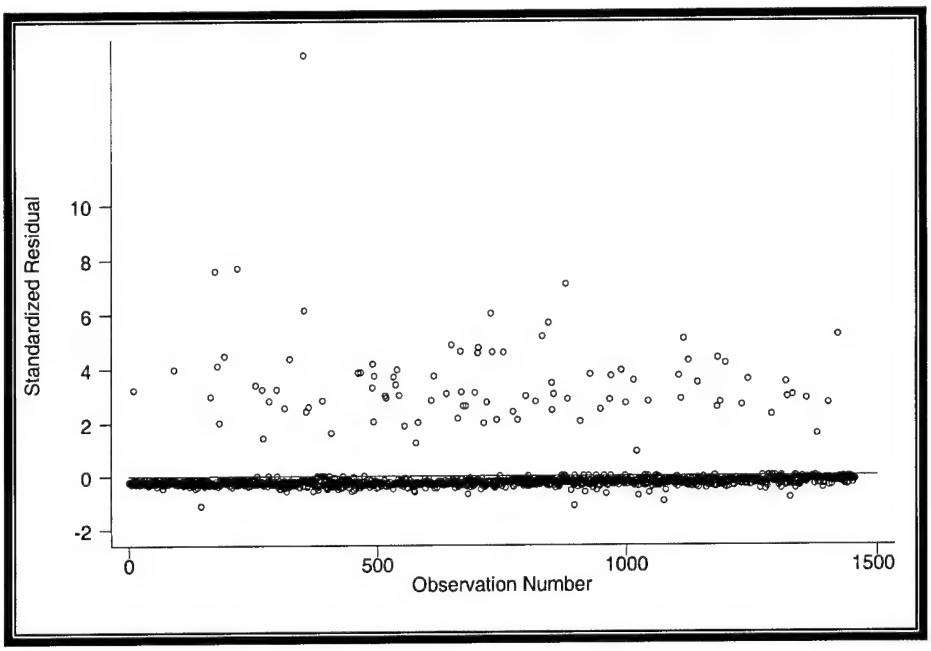
Cutoff graph for the full version of model 1 – cutoff point is 0.065.



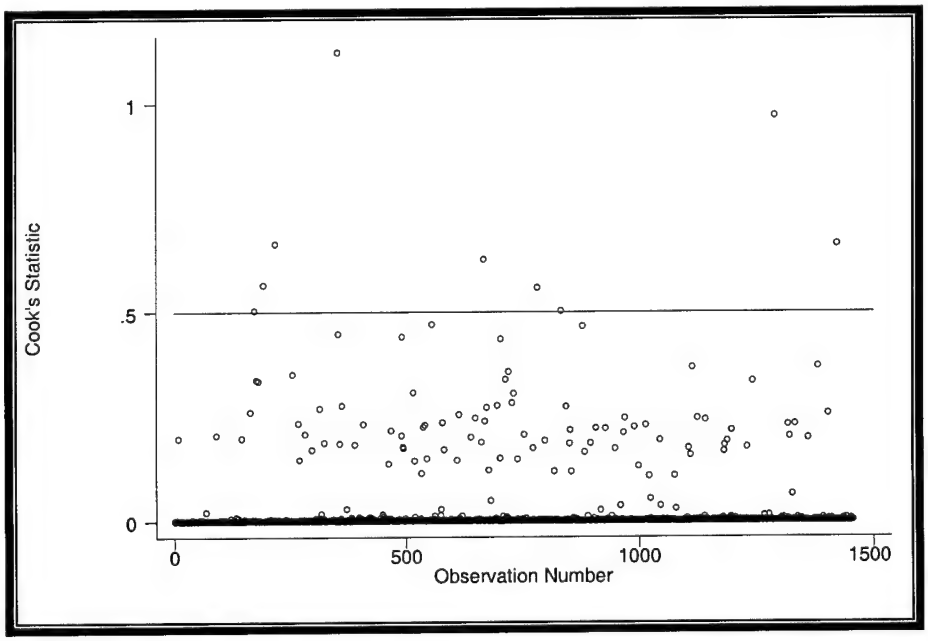
ROC curve for the full version of model 1.



Residual graph for full version of model 1 – the one outlier (Naval Air Facility, Adak, AK) was investigated and could not be rejected on theoretical grounds.



Cook's statistic graph for full version of model 1 – the outliers (Naval Air Facility Adak, McClellan AFB, Fort Pickett, Eaker AFB, Naval Station Charleston, Naval Electronic Sys Engr Act, Red River Army Depot, Great Falls Air Guard Station, and Pease AFB) were investigated and could not be rejected on theoretical grounds or data entry problems.



The results of clustering the database by base indicate that independence of observation issues are not a problem in the full version of model 1. Overall significance, significant variables and magnitudes of effects are very similar to the non-clustered results.

Logit estimates — **Number of obs = 1456**
Wald chi2(21) = 58.64
Prob > chi2 = 0.000
Log likelihood = -317.97089 — **Pseudo R2 = 0.0875**

(standard errors adjusted for clustering on base)

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0153107	0.0063303	-2.42 *	0.016	-0.0277178	-0.0029036
Total DoD Personnel (1,000)	-0.0107506	0.0181185	-0.59	0.553	-0.0462622	0.024761
Major Bases in State	0.0063089	0.0086731	0.73	0.467	-0.01069	0.0233078
Per Capita Def Spend (1,000)	-0.1468435	0.2557597	-0.57	0.566	-0.6481233	0.3544362
Army Variable	0.6029744	0.2980708	2.02 *	0.043	0.0187664	1.187182
Navy Variable	0.22694	0.276698	0.82	0.412	-0.3153781	0.7692581
State Delegation Size	-4.83367	2.452675	-1.97 *	0.049	-9.640825	-0.026515
Senate Armed Services Cmt	-0.1081179	0.2558416	-0.42	0.673	-0.6095582	0.3933224
Senate Defense Subcmt	-0.0904422	0.2711813	-0.33	0.739	-0.6219476	0.4410633
Senate Majority	-0.0427355	0.1670514	-0.26	0.798	-0.3701502	0.2846793
Senate Seniority	-0.0058679	0.0172091	-0.34	0.733	-0.0395971	0.0278614
House Armed Services Cmt	0.1041571	0.3162065	0.33	0.742	-0.5155962	0.7239103
House Defense Subcmt	-0.0194702	0.6189135	-0.03	0.975	-1.232518	1.193578
House Majority	-0.4057591	0.258751	-1.57 **	0.117	-0.9129018	0.1013835
House Seniority	0.0096803	0.0122399	0.79	0.429	-0.0143094	0.0336701
Defense Contributions (1,000)	-0.0146675	0.0083685	-1.75 *	0.08	-0.0310693	0.0017344
National Security Index Score	-0.0046037	0.0037561	-1.23	0.22	-0.0119655	0.0027582
Commission Variable	1.576798	0.4597333	3.43 *	0.001	0.6757369	2.477858
Presidential Variable	0.0731921	0.291215	0.25	0.802	-0.4975789	0.643963
Bases with Similar Mission	-0.0043258	0.0054797	-0.79	0.43	-0.0150658	0.0064141
Mission Variable	0.378264	0.2483775	1.52 **	0.128	-0.108547	0.8650749
Constant	-1.457048	0.6682274	-2.18 *	0.029	-2.76675	-0.1473462

*Significant at 0.10 or better (two-tailed z-test)

**Significant at 0.10 or better (one-tailed z-test)

Stata output for comparison of simplified full model 1 to economic/mission version of model 1. Results provide strong support for the inclusion of political variables.

Measures of Fit for logit of yearclosed

Model:	Simplified Political/Economic/ Mission Model	Economic/Mission Model	Difference
N:	1456	1456	0
Log-Lik Intercept Only	-348.473	-348.473	0
Log-Lik Full Model:	-321.205	-329.88	8.675
D:	642.411(1448)	659.760(1447)	17.349(1)
LR:	54.534(7)	37.185(8)	17.349(1)
Prob > LR:	0	0	0
McFadden's R2:	0.078	0.053	0.025
McFadden's Adj R2:	0.055	0.028	0.028
Maximum Likelihood	0.037	0.025	0.012
Cragg & Uhler's R2:	0.097	0.066	0.03
McKelvey and Zavoin	0.831	0.852	-0.021
Efron's R2:	0.040	0.022	0.018
Variance of y*:	19.478	22.271	-2.793
Variance of error:	3.29	3.29	0.000
Count R2:	0.935	0.935	0.000
Adj Count R2:	0.000	0.000	0.000
AIC:	0.452	0.465	-0.013
AIC*n:	658.411	677.76	-19.349
BIC:	-9904.022	-9879.39	-24.633
BIC':	-3.55	21.082	-24.633

Difference of 24.633 in BIC' provides very strong support for the political model.

Hazard model results for the economic/mission version of model 1.

Cox regression
-- Breslow method for ties

Number of obs = 1456
Wald chi2(8) = 45.20
Prob > chi2 = 0.0000
Pseudo R2 = 0.0399

Log likelihood = -592.80485

End Outcome	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0203418	0.006197	-3.28	0.001	-0.0324876	-0.0081959
Total DoD Personnel (1,000)	0.0034834	0.0143348	0.24	0.808	-0.0246123	0.0315792
Major Bases in State	0.0275164	0.0068397	4.02	0.000	0.0141109	0.0409219
Per Capita Def Spend (1,000)	-0.6599107	0.2407675	-2.74	0.006	-1.131806	-0.188015
Army Variable	0.6418692	0.261298	2.46	0.014	0.1297346	1.154004
Navy Variable	0.1194183	0.286116	0.42	0.676	-0.4413588	0.6801954
Bases with Similiar Mission	0.0027404	0.0059744	0.46	0.646	-0.0089693	0.01445
Mission Variable	0.3264197	0.2309652	1.41	0.158	-0.1262637	0.7791031

Hazard model results for the full version of model 1.

Cox regression
-- Breslow method for ties

Number of obs = 1456
Wald chi2(21) = 92.77
Prob > chi2 = 0.0000
Pseudo R2 = 0.0578

Log likelihood = -581.76754

End Outcome	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0156622	0.0054584	-2.87	0.004	-0.0263605	-0.004964
Total DoD Personnel (1,000)	-0.0004911	0.0148677	-0.03	0.974	-0.0296312	0.0286491
Major Bases in State	0.0252021	0.010101	2.50	0.013	0.0054045	0.0449996
Per Capita Def Spend (1,000)	-0.4254619	0.2836967	-1.50	0.134	-0.9814973	0.1305734
Army Variable	0.4958378	0.2919559	1.70	0.089	-0.0763852	1.068061
Navy Variable	0.1513804	0.2879768	0.53	0.599	-0.4130437	0.7158046
State Delegation Size	-1.905315	2.316819	-0.82	0.411	-6.446197	2.635568
Senate Armed Services Cmt	0.3275337	0.2785025	1.18	0.240	-0.2183213	0.8733887
Senate Defense Subcmt	-0.0227677	0.2542734	-0.09	0.929	-0.5211344	0.4755991
Senate Majority	0.0704898	0.1469331	0.48	0.631	-0.2174938	0.3584735
Senate Seniority	0.0124373	0.0146878	0.85	0.397	-0.0163502	0.0412248
House Armed Services Cmt	0.1188865	0.2995321	0.40	0.691	-0.4681856	0.7059585
House Defense Subcmt	0.0602015	0.5847918	0.10	0.918	-1.085969	1.206372
House Majority	-0.1877271	0.2040986	-0.92	0.358	-0.5877531	0.2122989
House Seniority	0.01364	0.011731	1.16	0.245	-0.0093524	0.0366325
Defense Contributions (1,000)	-0.0125995	0.006745	-1.87	0.062	-0.0258195	0.0006204
National Security Index Score	-0.004595	0.0034604	-1.33	0.184	-0.0113772	0.0021871
Commission Variable	0.6514874	0.3972431	1.64	0.101	-0.1270947	1.43007
Presidential Variable	0.5236876	0.3145899	1.66	0.096	-0.0928972	1.140272
Bases with Similar Mission	0.0024178	0.0059834	0.40	0.686	-0.0093094	0.014145
Mission Variable	0.4591403	0.2438006	1.88	0.060	-0.0187001	0.9369807

Appendix 5 – Model 2 Regression Results

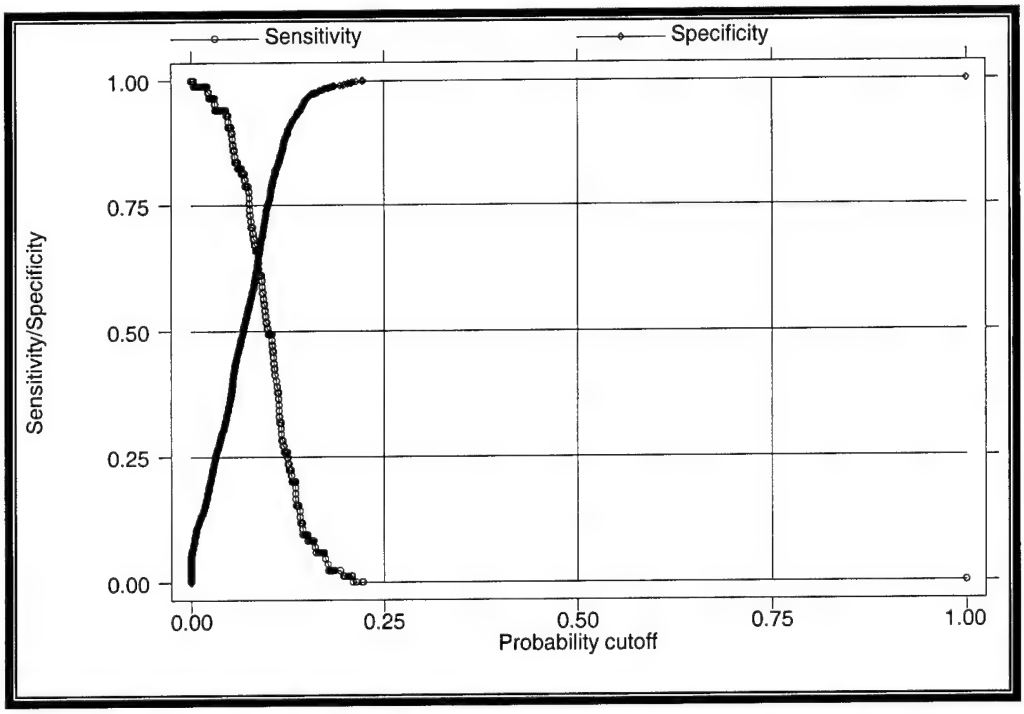
This table lists the summary statistics for model 2 – no guard and reserve. Note the number of observations has changed from 1456 to 1196.

Independent Variable	Obs	Mean	Std. Dev.	Min	Max
Acreage (1,000)	1196	51.47533	246.6893	0.001	4545.214
Total DoD Personnel (1,000)	1196	6.947355	8.000579	0.301	65.336
Major Bases in State	1196	18.29431	18.00949	1	60
Per Capita Defense Spending (1,000)	1196	1.191037	0.6734701	0.217	2.793
Army Variable	1196	0.2859532	0.4520562	0	1
Navy Variable	1196	0.4280936	0.4950094	0	1
State Delegation Size	1196	0.0983456	0.0822324	0.019	0.333
Senate Armed Services Cmt	1196	0.4414716	0.4967703	0	1
Senate Defense Subcmt	1196	0.3712375	0.4833379	0	1
Senate Majority	1196	1.126254	0.7144273	0	2
Senate Seniority	1196	15.88462	8.321373	1	41
House Armed Services Cmt	1196	0.3486622	0.4767462	0	1
House Defense Subcmt	1196	0.0618729	0.2410254	0	1
House Majority	1196	0.5585284	0.4967703	0	1
House Seniority	1196	9.680602	8.033298	1	44
Defense Contributions (1,000)	1196	17.66513	23.43705	0	162
National Security Index Score	1196	69.24164	35.35471	0	100
Commission Variable	1196	0.0183946	0.1344299	0	1
Presidential Variable	1196	0.7399666	0.438836	0	1
Bases with Similar Mission	1196	48.20903	20.80774	1	78
Mission Variable	1196	0.298495	0.4577892	0	1

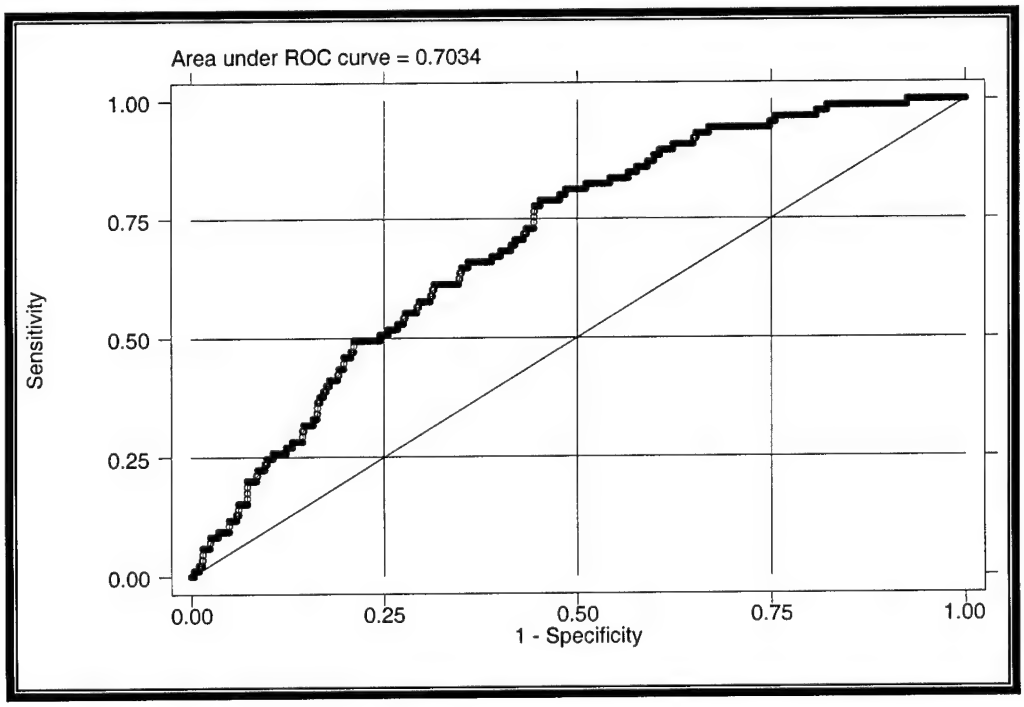
This table lists the measure of fit statistics for the economic version of model 2. Note that all measure of fit are larger than those found in the economic version of model 1 indicating that eliminating guard and reserve bases leads to a slightly better fitting model.

Economic/Mission Version of Model Two			
McFadden's R2:	0.069	McFadden's Adj R2:	0.04
Maximum Likelihood R2:	0.035	Cragg & Uhler's R2:	0.087
McKelvey and Zavoina's R2:	0.944		
Variance of y*:	58.734	Variance of error:	3.29

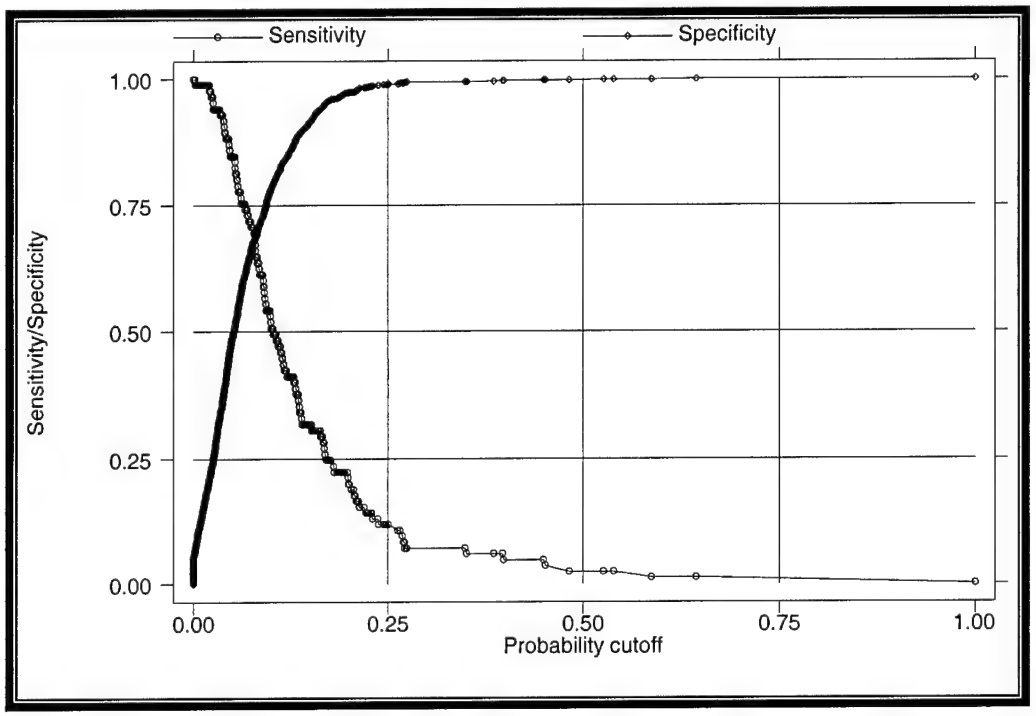
Cutoff graph for the economic version of model 2 – cutoff point is 0.072.



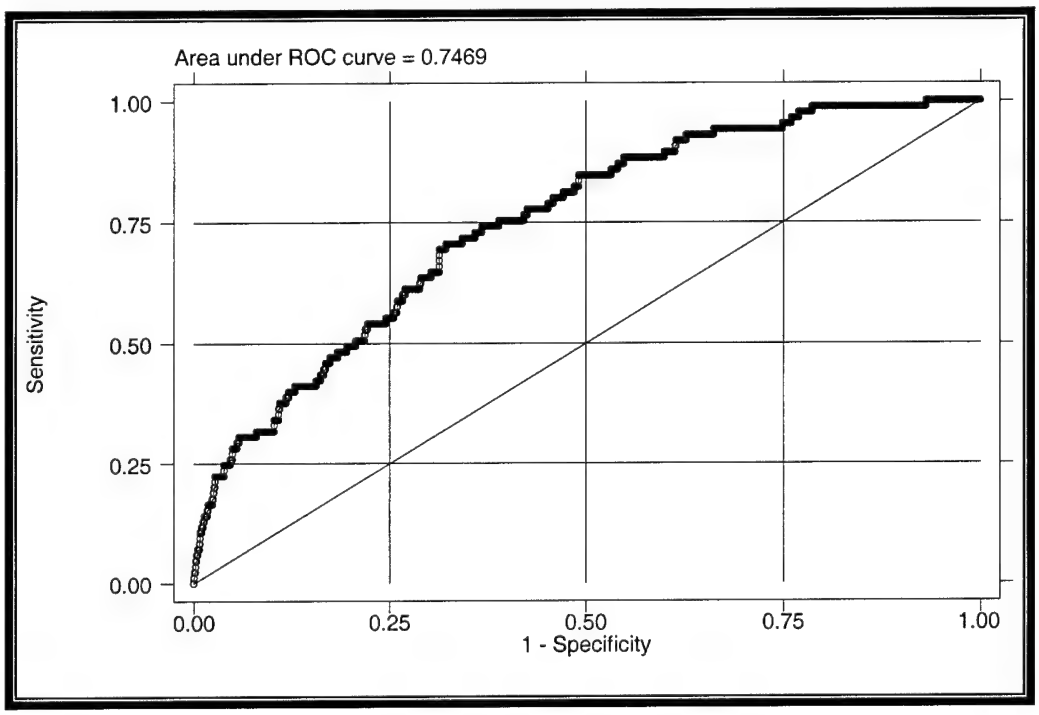
ROC graph for the economic version of model 2 – area under curve is 0.7034.



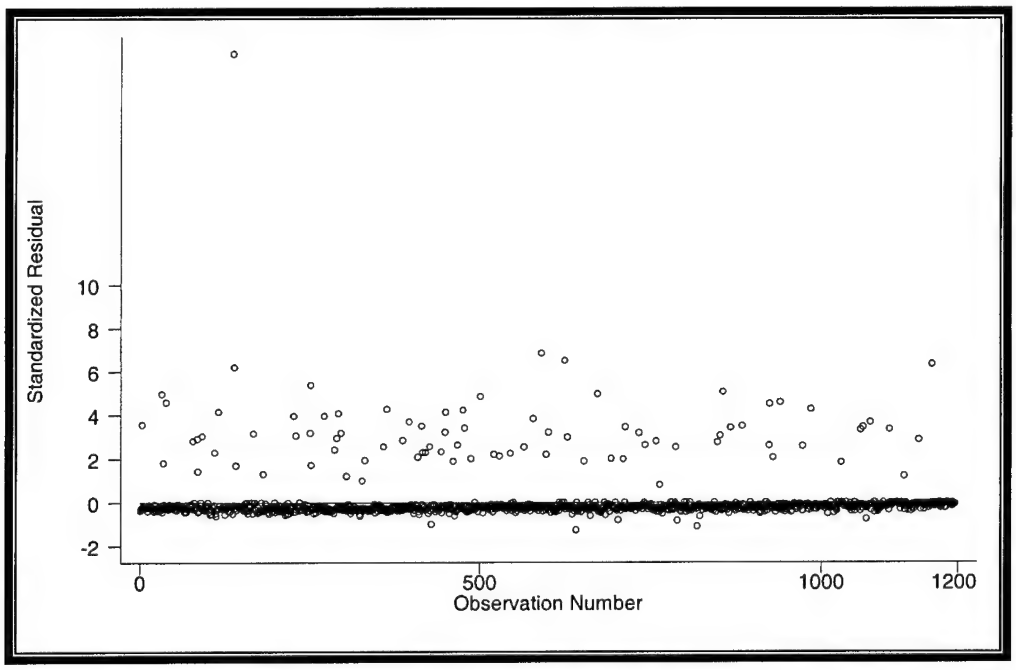
Cutoff graph for the full version of model 2 – cutoff point is 0.072.



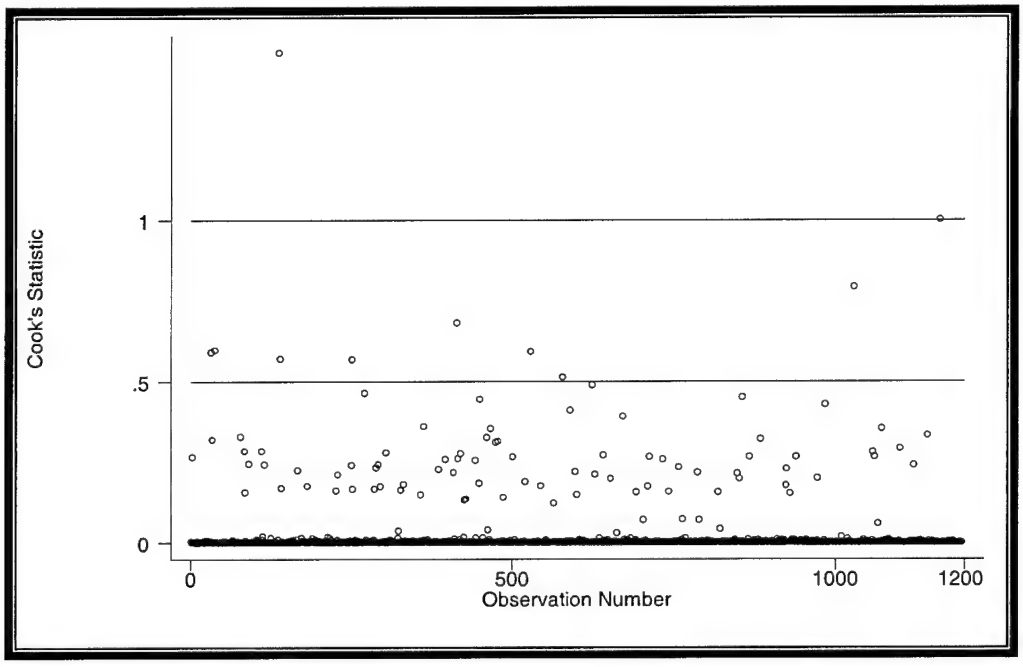
ROC graph for the full version of model 2 – area under curve is 0.7469.



Residual graph for full version of model 2 – the one outlier (Naval Air Facility, Adak, AK) was investigated and could not be rejected on theoretical grounds (the data was not entered incorrectly).



Cook's statistic graph for full version of model 2 – the one outlier (Naval Air Facility, Adak, AK) was investigated and could not be rejected on theoretical grounds.



The results of clustering the database by base indicate that independence of observation issues are not a problem in the full version of model 2. The only overall statistic that changed was the Wald chi2 figure which increased by less than four.

Logit estimates — **Number of obs = 1196**
Wald chi2(21) = 58.41
Prob > chi2 = 0.0000
Log likelihood = -271.6876 — **Pseudo R2 = 0.1140**

(standard errors adjusted for clustering on base)

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0236518	0.0103882	-2.28 *	0.023	-0.0440122	-0.0032913
Total DoD Personnel (1,000)	-0.0255373	0.0232458	-1.1	0.272	-0.0710982	0.0200236
Major Bases in State	0.0080366	0.0090206	0.89	0.373	-0.0096434	0.0257167
Per Capita Def Spend (1,000)	-0.3091698	0.2907287	-1.06	0.288	-0.8789877	0.260648
Army Variable	-0.0422112	0.329157	-0.13	0.898	-0.687347	0.6029246
Navy Variable	-0.3858316	0.2874644	-1.34 **	0.180	-0.9492513	0.1775882
State Delegation Size	-3.494098	2.366595	-1.48 **	0.140	-8.132539	1.144344
Senate Armed Services Cmt	-0.0536021	0.268048	-0.2	0.842	-0.5789666	0.4717624
Senate Defense Subcmt	-0.0805668	0.2937924	-0.27	0.784	-0.6563893	0.4952556
Senate Majority	-0.0041798	0.1759261	-0.02	0.981	-0.3489886	0.340629
Senate Seniority	-0.00715	0.0191559	-0.37	0.709	-0.0446948	0.0303948
House Armed Services Cmt	0.0990975	0.3216575	0.31	0.758	-0.5313396	0.7295346
House Defense Subcmt	0.0242927	0.6092366	0.04	0.968	-1.169789	1.218375
House Majority	-0.4680541	0.2780295	-1.68 *	0.092	-1.012982	0.0768738
House Seniority	0.0039725	0.0130972	0.3	0.762	-0.0216975	0.0296425
Defense Contributions (1,000)	-0.0160552	0.0081728	-1.96 *	0.049	-0.0320737	-0.0000368
National Security Index Score	-0.0086368	0.0041127	-2.1 *	0.036	-0.0166976	-0.000576
Commission Variable	1.744212	0.497982	3.5 *	0.000	0.7681856	2.720239
Presidential Variable	0.0433508	0.3220009	0.13	0.893	-0.5877594	0.674461
Bases with Similar Mission	-0.0006977	0.0062387	-0.11	0.911	-0.0129252	0.0115298
Mission Variable	0.239966	0.2740449	0.88	0.381	-0.2971522	0.7770842
Constant	-0.5402282	0.6912258	-0.78	0.434	-1.895006	0.8145494

*Significant at 0.10 or better (two-tailed z-test)

**Significant at 0.10 or better (one-tailed z-test)

Stata output for comparison of simplified full model 2 to economic/mission version of model 2. Results provide strong support for the inclusion of political variables.

Measures of Fit for logit of yearclosed

Model:	Simplified Political/Economic/ Mission Model	Economic/Mission Model	Difference
N:	1196	1196	0
Log-Lik Intercept Only:	-306.653	-306.653	0
Log-Lik Full Model:	-274.056	-285.355	11.299
D:	548.112(1188)	570.709(1187)	22.598(1)
LR:	65.194(7)	42.596(8)	22.598(1)
Prob > LR:	0	0	0
McFadden's R2:	0.106	0.069	0.037
McFadden's Adj R2:	0.08	0.04	0.04
Maximum Likelihood R2:	0.053	0.035	0.018
Cragg & Uhler's R2:	0.132	0.087	0.045
McKelvey and Zavoina's R2:	0.921	0.944	-0.023
Efron's R2:	0.069	0.032	0.037
Variance of y*:	41.72	58.734	-17.014
Variance of error:	3.29	3.29	0.000
Count R2:	0.930	0.929	0.001
Adj Count R2:	0.012	0.00	0.012
AIC:	0.472	0.492	-0.021
AIC*n:	564.112	588.709	-24.598
BIC:	-7870.933	-7841.249	-29.684
BIC':	-15.586	14.098	-29.684

Difference of 29.684 in BIC' provides very strong support for the political model.

Hazard model results for the economic/mission version of model 2.

Cox regression
-- Breslow method for ties

Number of obs = 1196
Wald chi2(8) = 33.78
Prob > chi2 = 0.0000
Pseudo R2 = 0.0520

Log likelihood = -514.28494

End Outcome	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.0300978	0.0106221	-2.83	0.005	-0.0509167	-0.0092788
Total DoD Personnel (1,000)	-0.0096914	0.0185562	-0.52	0.601	-0.0460609	0.026678
Major Bases in State	0.0260487	0.0070663	3.69	0.000	0.0121989	0.0398985
Per Capita Def Spend (1,000)	-0.7836916	0.2788301	-2.81	0.005	-1.330188	-0.2371947
Army Variable	0.0213907	0.2857133	0.07	0.940	-0.5385971	0.5813786
Navy Variable	-0.4573464	0.2762848	-1.66	0.098	-0.9988546	0.0841618
Bases with Similiar Mission	0.0097604	0.0070421	1.39	0.166	-0.0040418	0.0235626
Mission Variable	0.0691187	0.2537755	0.27	0.785	-0.4282721	0.5665095

Hazard model results for the full version of model 2.

Cox regression
-- Breslow method for ties

Number of obs = 1196
Wald chi2(21) = 90.40
Prob > chi2 = 0.0000
Pseudo R2 = 0.0794

Log likelihood = -499.42337

End Outcome	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage (1,000)	-0.023135	0.0095442	-2.42	0.015	-0.0418413	-0.0044287
Total DoD Personnel (1,000)	-0.0215908	0.0220088	-0.98	0.327	-0.0647272	0.0215456
Major Bases in State	0.0245013	0.010429	2.35	0.019	0.0040608	0.0449418
Per Capita Def Spend (1,000)	-0.6483109	0.3268699	-1.98	0.047	-1.288964	-0.0076577
Army Variable	-0.3116543	0.3238586	-0.96	0.336	-0.9464055	0.3230969
Navy Variable	-0.524609	0.2809812	-1.87	0.062	-1.075322	0.026104
State Delegation Size	-0.7222672	2.292806	-0.32	0.753	-5.216084	3.77155
Senate Armed Services Cmt	0.4029912	0.2822517	1.43	0.153	-0.1502119	0.9561944
Senate Defense Subcmt	-0.0521312	0.2661037	-0.20	0.845	-0.5736849	0.4694226
Senate Majority	0.1286882	0.1520095	0.85	0.397	-0.1692449	0.4266214
Senate Seniority	0.0167808	0.0155325	1.08	0.280	-0.0136623	0.047224
House Armed Services Cmt	-0.0415262	0.3059711	-0.14	0.892	-0.6412186	0.5581661
House Defense Subcmt	-0.0349484	0.5574754	-0.06	0.950	-1.12758	1.057683
House Majority	-0.2689548	0.2193123	-1.23	0.220	-0.698799	0.1608894
House Seniority	0.0054091	0.0121095	0.45	0.655	-0.0183251	0.0291433
Defense Contributions (1,000)	-0.0116703	0.0061867	-1.89	0.059	-0.023796	0.0004554
National Security Index Score	-0.0094499	0.0037605	-2.51	0.012	-0.0168204	-0.0020794
Commission Variable	0.6824046	0.3583624	1.90	0.057	-0.0199728	1.384782
Presidential Variable	0.5980952	0.3480151	1.72	0.086	-0.0840019	1.280192
Bases with Similar Mission	0.0105825	0.0073641	1.44	0.151	-0.0038509	0.0250159
Mission Variable	0.2842831	0.2668446	1.07	0.287	-0.2387227	0.807289

Appendix 6 – Model 1 Sensitivity Analysis

Regression results for 1988 BRAC observations (sensitivity analysis – model 1).

Year = 1988

note: housedefenseappropcmt~=0 predicts failure perfectly
housedefenseappropcmt dropped and 21 obs not used
note: commisionvar~=0 predicts failure perfectly
commisionvar dropped and 1 obs not used

Logit estimates — **Number of obs = 372**; **Wald chi2(19) = 92.62**; **Prob > chi2 = 0.0000**

Log likelihood = -47.969009 — **Pseudo R2 = 0.2368**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0033741	0.0031871	-1.06	0.290	-0.0096208	0.0028725
Total DoD Personnel	-0.1261556	0.0819514	-1.54	0.124	-0.2867773	0.0344662
Major Bases in State	0.0318411	0.0263352	1.21	0.227	-0.0197749	0.083457
Per Capita Def Spending	-0.5571129	0.5999086	-0.93	0.353	-1.732912	0.6186864
Army	1.185733	0.8701172	1.36	0.173	-0.5196649	2.891132
Navy	-1.158567	1.085109	-1.07	0.286	-3.285341	0.968208
State Delegation	1.874956	4.498494	0.42	0.677	-6.941931	10.69184
Seanate Armed Serv	1.554138	1.137811	1.37	0.172	-0.6759308	3.784207
Senate Def Committee	0.4478282	0.9774088	0.46	0.647	-1.467858	2.363514
Senate Majority	-0.5930216	0.4180684	-1.42	0.156	-1.412421	0.2263775
Senate Seniority	-0.1039102	0.0802175	-1.30	0.195	-0.2611335	0.0533132
House Armed Serv	1.242069	1.239803	1.00	0.316	-1.1879	3.672038
House Majority	-0.9554913	0.9490028	-1.01	0.314	-2.815503	0.90452
House Seniority	-0.0338774	0.0432627	-0.78	0.434	-0.1186708	0.050916
Defense Contributions	-0.0406312	0.0315373	-1.29	0.198	-0.1024432	0.0211808
NSI	-0.0186844	0.0121205	-1.54	0.123	-0.0424402	0.0050714
Presidential Var	-0.7961913	1.155164	-0.69	0.491	-3.060272	1.467889
Bases with Similiar Miss	0.0076018	0.0178149	0.43	0.670	-0.0273149	0.0425184
Mission Var	0.5273382	0.6574662	0.80	0.423	-0.761272	1.815948
Constant	0.0126981	1.336012	0.01	0.992	-2.605837	2.631233

Regression results for 1991 BRAC observations (sensitivity analysis – model 1).

Year = 1991

Logit estimates — **Number of obs = 383**; **Wald chi2(21) = 64.82**; **Prob > chi2 = 0.0000**

Log likelihood = -80.561707 — **Pseudo R2 = 0.1523**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0286326	0.0111494	-2.57	0.01	-0.050485	-0.0067802
Total DoD Personnel	0.0296886	0.0281253	1.06	0.291	-0.0254361	0.0848132
Major Bases in State	-0.0001028	0.0196825	-0.01	0.996	-0.0386797	0.0384742
Per Capita Def Spending	-0.3927794	0.4666302	-0.84	0.4	-1.307358	0.521799
Army	-0.482798	0.6031728	-0.8	0.423	-1.664995	0.699399
Navy	-0.5841257	0.515252	-1.13	0.257	-1.594001	0.4257496
State Delegation	-7.035286	4.436149	-1.59	0.113	-15.72998	1.659406
Seanate Armed Serv	0.4050042	0.6019942	0.67	0.501	-0.7748828	1.584891
Senate Def Committee	-0.0819866	0.476893	-0.17	0.864	-1.01668	0.8527065
Senate Majority	-0.5370158	0.3993794	-1.34	0.179	-1.319785	0.2457534
Senate Seniority	0.0392643	0.0448015	0.88	0.381	-0.0485449	0.1270735
House Armed Serv	-0.9614668	0.8872338	-1.08	0.279	-2.700413	0.7774795
House Def Committee	-0.1468241	1.281136	-0.11	0.909	-2.657804	2.364156
House Majority	-0.4104404	0.7561389	-0.54	0.587	-1.892445	1.071565
House Seniority	-0.0175746	0.0324603	-0.54	0.588	-0.0811957	0.0460465
Defense Contributions	0.0010915	0.0168381	0.06	0.948	-0.0319106	0.0340936
NSI	-0.0105661	0.0115838	-0.91	0.362	-0.0332698	0.0121377
Commission Variable	1.885346	1.828985	1.03	0.303	-1.699399	5.47009
Presidential Var	0.8690034	0.7524551	1.15	0.248	-0.6057815	2.343788
Bases with Similiar Miss	-0.0036567	0.0104416	-0.35	0.726	-0.0241217	0.0168084
Mission Var	0.9099086	0.4686966	1.94	0.052	-0.0087199	1.828537
Constant	-1.111486	1.860125	-0.6	0.55	-4.757265	2.534292

Regression results for 1993 BRAC observations (sensitivity analysis – model 1).

Year = 1993

Logit estimates — **Number of obs = 356**; **Wald chi2(21) = 32.16**; **Prob > chi2 = 0.0564**; **Pseudo R2 = 0.2219**

Log likelihood = -76.307988

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0545215	0.0304169	-1.79	0.073	-0.1141376	0.0050945
Total DoD Personnel	0.0113166	0.0209622	0.54	0.589	-0.0297685	0.0524017
Major Bases in State	0.0024533	0.0279242	0.09	0.93	-0.052277	0.0571837
Per Capita Def Spending	0.0696755	0.6616535	0.11	0.916	-1.227141	1.366492
Army	-0.6315734	0.8822323	-0.72	0.474	-2.360717	1.09757
Navy	1.048165	0.5024248	2.09	0.037	0.0634302	2.032899
State Delegation	-24.40017	15.51156	-1.57	0.116	-54.80227	6.00193
Seanate Armed Serv	-0.0000403	0.9740892	0.00	1.00	-1.90922	1.90914
Senate Def Committee	0.5100282	0.7900168	0.65	0.519	-1.038376	2.058433
Senate Majority	1.025715	0.4418712	2.32	0.02	0.1596634	1.891767
Senate Seniority	0.0602309	0.0421149	1.43	0.153	-0.0223128	0.1427746
House Armed Serv	0.5039979	0.7980981	0.63	0.528	-1.060246	2.068241
House Def Committee	0.9532156	0.9902516	0.96	0.336	-0.9876418	2.894073
House Majority	-0.3708052	0.6715284	-0.55	0.581	-1.686977	0.9453662
House Seniority	0.0138121	0.0301005	0.46	0.646	-0.0451838	0.072808
Defense Contributions	-0.0279653	0.0179562	-1.56	0.119	-0.0631587	0.0072282
NSI	-0.0027187	0.0108602	-0.25	0.802	-0.0240043	0.0185669
Commission Variable	0.2659419	0.8554119	0.31	0.756	-1.410635	1.942518
Presidential Var	-0.686592	0.9507476	-0.72	0.47	-2.550023	1.176839
Bases with Similiar Miss	-0.0035177	0.0126954	-0.28	0.782	-0.0284002	0.0213648
Mission Var	0.378435	0.5564031	0.68	0.496	-0.7120951	1.468965
Constant	-2.616758	2.157385	-1.21	0.225	-6.845155	1.611639

Regression results for 1995 BRAC observations (sensitivity analysis – model 1).

Year = 1995

note: housedefenseappropcmt~=0 predicts failure perfectly
housedefenseappropcmt dropped and 13 obs not used

Logit estimates — **Number of obs = 310**; **Wald chi2(20) = 62.09**; **Prob > chi2 = 0.0000**; **Pseudo R2 = 0.2415**

Log likelihood = -65.919498

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0057828	0.005233	-1.11	0.269	-0.0160393	0.0044738
Total DoD Personnel	-0.0942555	0.0555521	-1.70	0.090	-0.2031356	0.0146246
Major Bases in State	0.0155574	0.0293658	0.53	0.596	-0.0419986	0.0731134
Per Capita Def Spending	-0.184514	0.5005388	-0.37	0.712	-1.165552	0.7965241
Army	2.274342	0.6421341	3.54	0.000	1.015783	3.532902
Navy	1.142349	0.879652	1.30	0.194	-0.581737	2.866436
State Delegation	-0.0965996	4.026044	-0.02	0.981	-7.987501	7.794302
Seanate Armed Serv	-0.7915101	0.5913802	-1.34	0.181	-1.950594	0.3675738
Senate Def Committee	-0.163916	0.5585741	-0.29	0.769	-1.258701	0.9308691
Senate Majority	0.2338697	0.4658227	0.50	0.616	-0.679126	1.146865
Senate Seniority	-0.0077576	0.0277498	-0.28	0.780	-0.0621462	0.046631
House Armed Serv	0.4271117	0.5600121	0.76	0.446	-0.6704917	1.524715
House Majority	0.0099623	0.8915679	0.01	0.991	-1.737479	1.757403
House Seniority	0.0634852	0.0287644	2.21	0.027	0.0071079	0.1198624
Defense Contributions	-0.0102603	0.0146839	-0.70	0.485	-0.0390402	0.0185195
NSI	-0.0057646	0.0117393	-0.49	0.623	-0.0287733	0.017244
Commission Variable	3.213216	1.021602	3.15	0.002	1.210912	5.21552
Presidential Var	0.1153198	0.6453521	0.18	0.858	-1.149547	1.380187
Bases with Similiar Miss	0.0039067	0.0159869	0.24	0.807	-0.027427	0.0352405
Mission Var	-0.6551445	0.7498754	-0.87	0.382	-2.124873	0.8145842
Constant	-3.618691	1.712575	-2.11	0.035	-6.975276	-0.2621056

Regression results for Air Force observations (sensitivity analysis – model 1).

Service = Air Force

Logit estimates — **Number of obs = 550**; **Wald chi2(19) = 50.17**; **Prob > chi2 = 0.0001**; **Pseudo R2 = 0.2582**

Log likelihood = -86.369981

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0846276	0.0338273	-2.50	0.012	-0.150928	-0.0183273
Total DoD Personnel	0.0757987	0.0342903	2.21	0.027	0.008591	0.1430065
Major Bases in State	0.0239397	0.0227566	1.05	0.293	-0.0206624	0.0685418
Per Capita Def Spending	-0.314318	0.7421261	-0.42	0.672	-1.768858	1.140222
State Delegation	-5.188613	4.189755	-1.24	0.216	-13.40038	3.023156
Seanate Armed Serv	0.4644232	0.4954881	0.94	0.349	-0.5067156	1.435562
Senate Def Committee	0.2898844	0.523934	0.55	0.580	-0.7370075	1.316776
Senate Majority	-0.027254	0.3406756	-0.08	0.936	-0.6949658	0.6404578
Senate Seniority	-0.0328045	0.0388521	-0.84	0.398	-0.1089531	0.0433442
House Armed Serv	-1.040845	0.7179842	-1.45	0.147	-2.448068	0.3663784
House Def Committee	-0.1916672	0.9069222	-0.21	0.833	-1.969202	1.585868
House Majority	-0.3892218	0.5291364	-0.74	0.462	-1.42631	0.6478664
House Seniority	0.0232483	0.0236293	0.98	0.325	-0.0230643	0.069561
Defense Contributions	-0.0129613	0.0120085	-1.08	0.280	-0.0364975	0.010575
NSI	0.005393	0.0090995	0.59	0.553	-0.0124417	0.0232276
Commission Variable	2.309418	0.8155787	2.83	0.005	0.7109128	3.907922
Presidential Var	2.338891	0.7560056	3.09	0.002	0.8571477	3.820635
Bases with Similiar Miss	0.0022729	0.008589	0.26	0.791	-0.0145612	0.0191071
Mission Var	1.668326	0.4619259	3.61	0.000	0.7629678	2.573684
Constant	-5.247218	1.541213	-3.40	0.001	-8.267939	-2.226497

Regression results for Army observations (sensitivity analysis – model 1).

Service = Army

Logit estimates — **Number of obs = 372**; **Wald chi2(19) = 32.78**; **Prob > chi2 = 0.0255**; **Pseudo R2 = 0.1814**

Log likelihood = -79.259292

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.005731	0.002907	-1.97	0.049	-0.0114286	-0.0000334
Total DoD Personnel	-0.187644	0.1107235	-1.69	0.090	-0.4046581	0.0293702
Major Bases in State	0.0099636	0.0198848	0.50	0.616	-0.0290099	0.0489371
Per Capita Def Spending	-0.8109389	0.4684319	-1.73	0.083	-1.729049	0.1071708
State Delegation	4.132398	5.609333	0.74	0.461	-6.861692	15.12649
Seanate Armed Serv	0.6090305	0.6279634	0.97	0.332	-0.6217551	1.839816
Senate Def Committee	-0.6671523	0.6253365	-1.07	0.286	-1.892789	0.5584848
Senate Majority	-0.624108	0.298075	-2.09	0.036	-1.208324	-0.0398918
Senate Seniority	-0.0280619	0.0401542	-0.70	0.485	-0.1067627	0.0506389
House Armed Serv	0.2903835	0.598046	0.49	0.627	-0.8817652	1.462532
House Def Committee	1.308316	1.474059	0.89	0.375	-1.580786	4.197417
House Majority	-0.1825881	0.4888874	-0.37	0.709	-1.14079	0.7756136
House Seniority	-0.0090458	0.0315954	-0.29	0.775	-0.0709716	0.0528801
Defense Contributions	0.0031191	0.0125304	0.25	0.803	-0.0214399	0.0276782
NSI	-0.0124007	0.006216	-1.99	0.046	-0.0245838	-0.0002177
Commission Variable	1.079443	1.377107	0.78	0.433	-1.619637	3.778523
Presidential Var	-0.5635222	0.5174209	-1.09	0.276	-1.577649	0.4506042
Bases with Similiar Miss	-0.0117727	0.0144602	-0.81	0.416	-0.0401142	0.0165688
Mission Var	0.7523829	0.715765	1.05	0.293	-0.6504906	2.155256
Constant	1.526624	1.676335	0.91	0.362	-1.758933	4.812181

Regression results for Navy/Marines observations (sensitivity analysis – model 1).

Service = Navy/Marines

Logit estimates — **Number of obs = 467**; **Wald chi2(19) = 32.58**; **Prob > chi2 = 0.0269**

Log likelihood = -111.07153 — **Pseudo R2 = 0.1067**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0311345	0.031473	-0.99	0.323	-0.0928204	0.0305514
Total DoD Personnel	-0.0015409	0.0231223	-0.07	0.947	-0.0468598	0.0437779
Major Bases in State	-0.000692	0.0167625	-0.04	0.967	-0.033546	0.032162
Per Capita Def Spending	-0.1893293	0.5238267	-0.36	0.718	-1.216011	0.8373521
State Delegation	-7.771875	5.962123	-1.30	0.192	-19.45742	3.913672
Seanate Armed Serv	-1.001374	0.411889	-2.43	0.015	-1.808662	-0.1940868
Senate Def Committee	-0.116045	0.4912941	-0.24	0.813	-1.078964	0.8468738
Senate Majority	0.1919021	0.2828463	0.68	0.497	-0.3624665	0.7462707
Senate Seniority	0.0153625	0.032092	0.48	0.632	-0.0475366	0.0782616
House Armed Serv	0.4753272	0.5819235	0.82	0.414	-0.6652219	1.615876
House Def Committee	0.1033912	1.28118	0.08	0.936	-2.407676	2.614458
House Majority	-0.0490002	0.4949177	-0.10	0.921	-1.019021	0.9210208
House Seniority	0.0191525	0.0203832	0.94	0.347	-0.0207979	0.0591029
Defense Contributions	-0.0242393	0.0156037	-1.55	0.120	-0.054822	0.0063435
NSI	-0.003131	0.0081348	-0.38	0.700	-0.0190749	0.012813
Commission Variable	0.8523369	0.8141877	1.05	0.295	-0.7434417	2.448116
Presidential Var	-0.9537007	0.4721484	-2.02	0.043	-1.879094	-0.0283069
Bases with Similiar Miss	0.0122557	0.0125113	0.98	0.327	-0.0122661	0.0367775
Mission Var	-0.7383361	0.6115506	-1.21	0.227	-1.936953	0.4602811
Constant	-1.201381	1.272574	-0.94	0.345	-3.69558	1.292819

Regression results for DoD defined Major Bases (sensitivity analysis – model 1).

Category = Major Bases defined by the DoD

Logit estimates — **Number of obs = 643**; **Wald chi2(21) = 58.02**; **Prob > chi2 = 0.0000**

Log likelihood = -112.63483 — **Pseudo R2 = 0.2197**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0607142	0.033239	-1.83	0.068	-0.1258615	0.0044331
Total DoD Personnel	-0.0139078	0.0285421	-0.49	0.626	-0.0698493	0.0420337
Major Bases in State	0.0246508	0.0136006	1.81	0.070	-0.0020058	0.0513074
Per Capita Def Spending	-0.8337948	0.6122227	-1.36	0.173	-2.033729	0.3661396
Army	-0.2920239	0.6891597	-0.42	0.672	-1.642752	1.058704
Navy	0.2280138	0.4868545	0.47	0.640	-0.7262034	1.182231
State Delegation	-2.638144	2.757233	-0.96	0.339	-8.042222	2.765933
Seanate Armed Serv	0.2587293	0.3854689	0.67	0.502	-0.496776	1.014235
Senate Def Committee	0.5951295	0.3888059	1.53	0.126	-0.1669161	1.357175
Senate Majority	0.1780376	0.2821523	0.63	0.528	-0.3749708	0.731046
Senate Seniority	0.0026811	0.0289298	0.09	0.926	-0.0540202	0.0593824
House Armed Serv	-0.7859604	0.5206048	-1.51	0.131	-1.806327	0.2344062
House Def Committee	-0.8552526	1.152361	-0.74	0.458	-3.113838	1.403333
House Majority	-0.711107	0.409387	-1.74	0.082	-1.513491	0.0912768
House Seniority	-0.0035705	0.0208521	-0.17	0.864	-0.0444398	0.0372989
Defense Contributions	-0.0116409	0.0141685	-0.82	0.411	-0.0394107	0.0161288
NSI	-0.007025	0.0061497	-1.14	0.253	-0.0190783	0.0050283
Commission Variable	1.795727	0.8447487	2.13	0.034	0.14005	3.451404
Presidential Var	0.6597293	0.5793648	1.14	0.255	-0.4758048	1.795263
Bases with Similiar Miss	0.002205	0.0093752	0.24	0.814	-0.0161699	0.02058
Mission Var	0.818927	0.4693885	1.74	0.081	-0.1010576	1.738912
Constant	-1.879401	1.133287	-1.66	0.097	-4.100603	0.3418015

Model 1 – Major Bases as Defined by the Pentagon

Area of Interest	Pentagon Definition of Major Facility
Number of observations	643
Log Liklihood	-112.635
Wald chi2	58.02
Prob>chi2	0.000
Pseudo R^2	0.220
Area under ROC curve	0.851
Percent Correctly Specified	73.250
Range of Prediction	0 to 0.572
Significant Variables (two tailed, 0.10 or less)	Acreage # of Major Bases House Majority Commission Var Mission Var
Additional Significant Var one tailed, 0.10 or less)	Per Capita Def Spend Senate Def Committee House Armed Serv

Model 1 – Pentagon Major Bases Change in Odds

Var of Interest	Percent Change in Odds
Acreage	-5.9 *
Total DoD Personnel	-1.4
Major Bases in State	2.5 *
Per Capita Def Spending	-56.6 **
Army	-25.3
Navy	25.6
State Delegation	-92.9
Seanate Armed Serv	29.5
Senate Def Committee	81.3 **
Senate Majority	19.5
Senate Seniority	0.3
House Armed Serv	-54.4 **
House Def Committee	-57.5
House Majority	-50.9 *
House Seniority	-0.4
Defense Contributions	-1.2
NSI	-0.7
Commission Var	502.4 *
Presidential Var	93.4
Bases with Similiar Miss	0.2
Mission Var	126.8 *
* = signficant at 0.10 or better (two-tailed z-test)	
** = significant at 0.10 or better (one-tailed z-test)	

Appendix 7 – Model 2 Sensitivity Analysis

Regression results for 1988 BRAC observations (sensitivity analysis – model 2).

Year = 1988

note: housedefenseappropcmt~=0 predicts failure perfectly
housedefenseappropcmt dropped and 19 obs not used
note: commisionvar~=0 predicts failure perfectly
commisionvar dropped and 1 obs not used

Logit estimates — Number of obs = 317; Wald chi2(19) = 75.60; Prob > chi2 = 0.0000

Log likelihood = -43.33045 — Pseudo R2 = 0.2826

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0037876	0.0039935	-0.95	0.343	-0.0116147	0.0040396
Total DoD Personnel	-0.2503356	0.1105755	-2.26	0.024	-0.4670596	-0.0336116
Major Bases in State	0.0238659	0.0533195	0.45	0.654	-0.0806384	0.1283702
Per Capita Def Spending	-0.3958528	0.9284643	-0.43	0.670	-2.215609	1.423904
Army	-0.0922861	0.7889664	-0.12	0.907	-1.638632	1.45406
Navy	-2.335157	1.015599	-2.30	0.021	-4.325695	-0.3446185
State Delegation	-0.0048888	0.0655574	-0.07	0.941	-0.1333789	0.1236014
Seanate Armed Serv	1.413625	1.009612	1.40	0.161	-0.5651773	3.392427
Senate Def Committee	0.1321285	0.9186143	0.14	0.886	-1.668322	1.932579
Senate Majority	-0.6755359	0.4562755	-1.48	0.139	-1.56982	0.2187476
Senate Seniority	-0.0981122	0.0817735	-1.20	0.230	-0.2583854	0.062161
House Armed Serv	1.657918	1.360031	1.22	0.223	-1.007692	4.323529
House Majority	-1.569208	1.212786	-1.29	0.196	-3.946226	0.8078086
House Seniority	-0.0095378	0.042741	-0.22	0.823	-0.0933085	0.0742329
Defense Contributions	-0.0605973	0.0379997	-1.59	0.111	-0.1350753	0.0138808
NSI	-0.0267989	0.0148342	-1.81	0.071	-0.0558734	0.0022755
Presidential Var	-0.6175016	1.075919	-0.57	0.566	-2.726265	1.491262
Bases with Similiar Miss	0.0089267	0.01695	0.53	0.598	-0.0242947	0.0421481
Mission Var	0.1798395	0.7194188	0.25	0.803	-1.230195	1.589874
Constant	2.566084	2.153292	1.19	0.233	-1.654292	6.786459

Regression results for 1991 BRAC observations (sensitivity analysis – model 2).

Year = 1991

Logit estimates — Number of obs = 315; Wald chi2(21) = 60.36; Prob > chi2 = 0.0000

Log likelihood = -68.764028 — Pseudo R2 = 0.1896

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0470933	0.0250302	-1.88	0.060	-0.0961515	0.001965
Total DoD Personnel	0.0088333	0.0439509	0.20	0.841	-0.0773088	0.0949754
Major Bases in State	0.0366239	0.0415517	0.88	0.378	-0.0448159	0.1180637
Per Capita Def Spending	-1.239891	0.7338514	-1.69	0.091	-2.678214	0.1984311
Army	-0.972656	0.6446763	-1.51	0.131	-2.236198	0.2908863
Navy	-1.039552	0.5753257	-1.81	0.071	-2.167169	0.0880661
State Delegation	-0.0153316	0.0484948	-0.32	0.752	-0.1103796	0.0797165
Seanate Armed Serv	0.6488028	0.6116313	1.06	0.289	-0.5499726	1.847578
Senate Def Committee	0.4116462	0.5394555	0.76	0.445	-0.645667	1.46896
Senate Majority	-0.5886999	0.4247507	-1.39	0.166	-1.421196	0.2437962
Senate Seniority	0.018212	0.0428677	0.42	0.671	-0.0658071	0.1022311
House Armed Serv	-1.282865	0.8783321	-1.46	0.144	-3.004365	0.4386339
House Def Committee	-0.5417608	1.242642	-0.44	0.663	-2.977294	1.893772
House Majority	-0.4058769	0.8745527	-0.46	0.643	-2.119969	1.308215
House Seniority	-0.0394059	0.0379612	-1.04	0.299	-0.1138085	0.0349968
Defense Contributions	0.0093916	0.0171785	0.55	0.585	-0.0242775	0.0430608
NSI	-0.0166529	0.0132414	-1.26	0.209	-0.0426055	0.0092997
Commission Variable	1.431793	1.454891	0.98	0.325	-1.41974	4.283326
Presidential Var	0.0873033	0.8899042	0.10	0.922	-1.656877	1.831483
Bases with Similiar Miss	0.0056882	0.0130946	0.43	0.664	-0.0199767	0.0313531
Mission Var	0.6313911	0.5255907	1.20	0.230	-0.3987477	1.66153
Constant	0.5864736	2.291846	0.26	0.80	-3.905462	5.078409

Regression results for 1993 BRAC observations (sensitivity analysis – model 2).

Year = 1993

Logit estimates — **Number of obs = 288**; **Wald chi2(21) = 36.95**; **Prob > chi2 = 0.0171**

Log likelihood = -63.907152 — **Pseudo R2 = 0.2480**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0629562	0.0354529	-1.78	0.076	-0.1324426	0.0065301
Total DoD Personnel	0.0133947	0.0232646	0.58	0.565	-0.032203	0.0589924
Major Bases in State	-0.1001132	0.0606727	-1.65	0.099	-0.2190295	0.0188031
Per Capita Def Spending	0.8679626	0.9098631	0.95	0.340	-0.9153363	2.651261
Army	-0.680155	0.920037	-0.74	0.460	-2.483394	1.123084
Navy	0.9203344	0.554026	1.66	0.097	-0.1655366	2.006205
State Delegation	0.1766196	0.0654934	2.70	0.007	0.048255	0.3049843
Seanate Armed Serv	2.049512	1.055181	1.94	0.052	-0.0186045	4.117628
Senate Def Committee	1.348354	0.9872194	1.37	0.172	-0.5865603	3.283269
Senate Majority	1.392253	0.6250192	2.23	0.026	0.1672381	2.617268
Senate Seniority	0.0517013	0.0434152	1.19	0.234	-0.033391	0.1367936
House Armed Serv	-0.0464363	0.769551	-0.06	0.952	-1.554728	1.461856
House Def Committee	1.432799	1.327049	1.08	0.280	-1.168169	4.033767
House Majority	0.2670492	0.8734591	0.31	0.760	-1.444899	1.978998
House Seniority	0.0143723	0.0327409	0.44	0.661	-0.0497985	0.0785432
Defense Contributions	-0.021783	0.0174945	-1.25	0.213	-0.0560716	0.0125056
NSI	0.0019884	0.0121884	0.16	0.870	-0.0219005	0.0258772
Commission Variable	0.0914877	0.8183464	0.11	0.911	-1.512442	1.695417
Presidential Var	-0.3888987	0.8385828	-0.46	0.643	-2.032491	1.254693
Bases with Similiar Miss	-0.0040188	0.0142135	-0.28	0.777	-0.0318767	0.0238391
Mission Var	0.6479011	0.624455	1.04	0.299	-0.5760083	1.87181
Constant	-9.795408	3.066633	-3.19	0.001	-15.8059	-3.784918

Regression results for 1995 BRAC observations (sensitivity analysis – model 2).

Year = 1995 — **note: housedefenseappropcmt~=0 predicts failure perfectly housedefenseappropcmt dropped and 13 obs not used**

Logit estimates — **Number of obs = 246**; **Wald chi2(20) = 60.10**; **Prob > chi2 = 0.0000**

Log likelihood = -50.286852 — **Pseudo R2 = 0.2992**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0146027	0.015349	-0.95	0.341	-0.0446861	0.0154807
Total DoD Personnel	-0.1213733	0.0746541	-1.63	0.104	-0.2676925	0.024946
Major Bases in State	0.0122497	0.091994	0.13	0.894	-0.1680552	0.1925547
Per Capita Def Spending	-0.4088764	1.010975	-0.40	0.686	-2.39035	1.572597
Army	1.204011	0.9869074	1.22	0.222	-0.730292	3.138314
Navy	0.1575075	1.017816	0.15	0.877	-1.837375	2.15239
State Delegation	0.0063388	0.0633017	0.10	0.920	-0.1177302	0.1304079
Seanate Armed Serv	-1.407724	0.7595767	-1.85	0.064	-2.896467	0.0810194
Senate Def Committee	-0.0583217	0.6205155	-0.09	0.925	-1.27451	1.157866
Senate Majority	0.6112732	0.6222829	0.98	0.326	-0.6083789	1.830925
Senate Seniority	-0.0163527	0.0403187	-0.41	0.685	-0.095376	0.0626705
House Armed Serv	0.288797	0.680104	0.42	0.671	-1.044182	1.621776
House Majority	0.4197115	1.217111	0.34	0.730	-1.965782	2.805205
House Seniority	0.0596016	0.0296716	2.01	0.045	0.0014463	0.117757
Defense Contributions	-0.0141566	0.0173046	-0.82	0.413	-0.0480729	0.0197598
NSI	-0.014896	0.0172898	-0.86	0.389	-0.0487834	0.0189913
Commission Variable	3.47664	1.082868	3.21	0.001	1.354258	5.599021
Presidential Var	0.0117392	0.8005058	0.01	0.988	-1.557223	1.580702
Bases with Similiar Miss	0.0021888	0.0222125	0.10	0.922	-0.0413468	0.0457244
Mission Var	-0.464118	0.7580582	-0.61	0.540	-1.949885	1.021649
Constant	-1.908434	2.013955	-0.95	0.343	-5.855714	2.038847

Regression results for Air Force observations (sensitivity analysis – model 2).

Service = Air Force

Logit estimates — **Number of obs = 342**; **Wald chi2(19) = 65.87**; **Prob > chi2 = 0.0000**

Log likelihood = -60.005955 — **Pseudo R2 = 0.3647**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.1330144	0.0417252	-3.19	0.001	-0.2147942	-0.0512346
Total DoD Personnel	-0.0440167	0.0549697	-0.80	0.423	-0.1517554	0.063722
Major Bases in State	-0.0114555	0.0436738	-0.26	0.793	-0.0970545	0.0741435
Per Capita Def Spending	-0.5732482	1.13022	-0.51	0.612	-2.788438	1.641942
State Delegation	0.0663871	0.041296	1.61	0.108	-0.0145516	0.1473257
Seanate Armed Serv	1.599407	0.6242219	2.56	0.010	0.3759546	2.82286
Senate Def Committee	1.595705	0.6257327	2.55	0.011	0.3692916	2.822119
Senate Majority	0.2556851	0.4032883	0.63	0.526	-0.5347453	1.046116
Senate Seniority	-0.0507892	0.051233	-0.99	0.322	-0.1512041	0.0496257
House Armed Serv	-1.583136	0.7661079	-2.07	0.039	-3.08468	-0.0815924
House Def Committee	-0.1690766	0.8367149	-0.20	0.840	-1.809008	1.470854
House Majority	-0.5981091	0.7168204	-0.83	0.404	-2.003051	0.8068331
House Seniority	0.0138642	0.0293538	0.47	0.637	-0.0436683	0.0713966
Defense Contributions	-0.0121564	0.0132954	-0.91	0.361	-0.0382149	0.0139021
NSI	-0.0100757	0.0107649	-0.94	0.349	-0.0311745	0.0110231
Commission Variable	2.41776	0.9345942	2.59	0.010	0.5859892	4.249531
Presidential Var	3.543268	0.9394098	3.77	0.000	1.702058	5.384477
Bases with Similiar Miss	-0.0091389	0.0108036	-0.85	0.398	-0.0303135	0.0120357
Mission Var	1.552131	0.5726644	2.71	0.007	0.4297291	2.674532
Constant	-5.516435	1.959736	-2.81	0.005	-9.357447	-1.675422

Regression results for Army observations (sensitivity analysis – model 2).

Service = Army

Logit estimates — **Number of obs = 342**; **Wald chi2(19) = 34.28**; **Prob > chi2 = 0.0170**

Log likelihood = -67.659899 — **Pseudo R2 = 0.2214**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0100386	0.0082265	-1.22	0.222	-0.0261623	0.0060851
Total DoD Personnel	-0.1605132	0.1093803	-1.47	0.142	-0.3748947	0.0538683
Major Bases in State	0.043468	0.0496157	0.88	0.381	-0.0537769	0.140713
Per Capita Def Spending	-1.153696	0.6728443	-1.71	0.086	-2.472446	0.165055
State Delegation	-0.0514008	0.053807	-0.96	0.339	-0.1568606	0.054059
Seanate Armed Serv	0.327577	0.6195971	0.53	0.597	-0.886811	1.541965
Senate Def Committee	-0.8032793	0.6916554	-1.16	0.245	-2.158899	0.5523403
Senate Majority	-0.6534625	0.3147317	-2.08	0.038	-1.270325	-0.0365997
Senate Seniority	-0.0426617	0.0483368	-0.88	0.377	-0.1374001	0.0520766
House Armed Serv	0.3249002	0.6190889	0.52	0.600	-0.8884917	1.538292
House Def Committee	1.650656	1.523358	1.08	0.279	-1.335071	4.636382
House Majority	-0.4695906	0.5592418	-0.84	0.401	-1.565684	0.6265032
House Seniority	-0.0045147	0.0343743	-0.13	0.896	-0.071887	0.0628576
Defense Contributions	-0.0034247	0.0126605	-0.27	0.787	-0.0282388	0.0213894
NSI	-0.0158498	0.007687	-2.06	0.039	-0.0309161	-0.0007836
Commission Variable	1.81279	1.612547	1.12	0.261	-1.347744	4.973323
Presidential Var	-0.9493418	0.6686039	-1.42	0.156	-2.259781	0.3610978
Bases with Similiar Miss	-0.0140585	0.0152369	-0.92	0.356	-0.0439223	0.0158052
Mission Var	0.8262616	0.8010118	1.03	0.302	-0.7436926	2.396216
Constant	3.74735	2.527241	1.48	0.138	-1.205952	8.700652

Regression results for Navy/Marines observations (sensitivity analysis – model 2).

Service = Navy/Marines

Logit estimates — **Number of obs = 512**; **Wald chi2(19) = 43.77**; **Prob > chi2 = 0.0010**

Log likelihood = -105.7274 — **Pseudo R2 = 0.1545**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0372784	0.0262762	-1.42	0.156	-0.0887789	0.014222
Total DoD Personnel	0.0029728	0.0217205	0.14	0.891	-0.0395985	0.0455442
Major Bases in State	-0.0796406	0.0323095	-2.46	0.014	-0.1429661	-0.0163152
Per Capita Def Spending	0.1879741	0.6145166	0.31	0.760	-1.016456	1.392404
State Delegation	0.1227181	0.0397262	3.09	0.002	0.0448562	0.20058
Seanate Armed Serv	-0.8509886	0.4127689	-2.06	0.039	-1.660001	-0.0419764
Senate Def Committee	-0.5268819	0.4747915	-1.11	0.267	-1.457456	0.4036924
Senate Majority	0.5539851	0.301856	1.84	0.066	-0.0376419	1.145612
Senate Seniority	0.0513909	0.0310091	1.66	0.097	-0.0093858	0.1121676
House Armed Serv	0.7415111	0.5512202	1.35	0.179	-0.3388606	1.821883
House Def Committee	0.3186007	1.30604	0.24	0.807	-2.241191	2.878392
House Majority	0.2093874	0.465488	0.45	0.653	-0.7029525	1.121727
House Seniority	0.0207588	0.0229654	0.90	0.366	-0.0242525	0.0657701
Defense Contributions	-0.0286973	0.0139931	-2.05	0.040	-0.0561232	-0.0012714
NSI	0.0021876	0.0083765	0.26	0.794	-0.01423	0.0186052
Commission Variable	1.293636	1.14038	1.13	0.257	-0.9414675	3.52874
Presidential Var	-0.8900538	0.523645	-1.70	0.089	-1.916379	0.1362715
Bases with Similiar Miss	0.0172342	0.0134337	1.28	0.200	-0.0090954	0.0435638
Mission Var	-0.9778076	0.6197018	-1.58	0.115	-2.192401	0.2367855
Constant	-5.259658	1.975413	-2.66	0.008	-9.131396	-1.38792

Regression results for DoD defined Major Bases (sensitivity analysis – model 2).

Category = Major Bases defined by the DoD

Logit estimates — **Number of obs = 617**; **Wald chi2(21) = 56.63**; **Prob > chi2 = 0.0000**

Log likelihood = -110.76835 — **Pseudo R2 = 0.2239**

Closed	Coeff	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Acreage	-0.0593672	0.0330323	-1.80	0.072	-0.1241093	0.0053749
Total DoD Personnel	-0.0244547	0.0329201	-0.74	0.458	-0.0889768	0.0400675
Major Bases in State	0.0171996	0.0137203	1.25	0.210	-0.0096917	0.044091
Per Capita Def Spending	-0.7399119	0.623586	-1.19	0.235	-1.962118	0.4822942
Army	-0.454565	0.7114342	-0.64	0.523	-1.848951	0.9398204
Navy	0.1166241	0.4777114	0.24	0.807	-0.8196731	1.052921
State Delegation	-4.16277	2.812081	-1.48	0.139	-9.674348	1.348808
Seanate Armed Serv	0.2978819	0.3762502	0.79	0.429	-0.439555	1.035319
Senate Def Committee	0.4105207	0.3781339	1.09	0.278	-0.330608	1.151649
Senate Majority	0.209188	0.2902916	0.72	0.471	-0.359773	0.778149
Senate Seniority	0.0102463	0.0297448	0.34	0.730	-0.0480525	0.0685451
House Armed Serv	-0.8445043	0.5152356	-1.64	0.101	-1.854348	0.165339
House Def Committee	-0.8968629	1.156336	-0.78	0.438	-3.163239	1.369513
House Majority	-0.7819764	0.414722	-1.89	0.059	-1.594817	0.0308638
House Seniority	-0.0030888	0.0202709	-0.15	0.879	-0.0428191	0.0366414
Defense Contributions	-0.011769	0.0135706	-0.87	0.386	-0.038367	0.014829
NSI	-0.0090841	0.0061856	-1.47	0.142	-0.0212077	0.0030394
Commission Variable	1.719181	0.8487713	2.03	0.043	0.0556198	3.382742
Presidential Var	0.6539441	0.5667563	1.15	0.249	-0.4568779	1.764766
Bases with Similiar Miss	0.0041199	0.0092342	0.45	0.655	-0.0139787	0.0222185
Mission Var	0.6648474	0.4663628	1.43	0.154	-0.249207	1.578902
Constant	-1.417339	1.112115	-1.27	0.203	-3.597043	0.7623654

Model Two – Year Summary

Area of Interest	Model - "Year"			
	1988	1991	1993	1995
Number of observations	317	315	288	246
Log Liklihood	-43.33045	-68.764	-63.907	-50.287
Wald chi2	75.6	60.36	36.95	60.1
Prob>chi2	0.000	0.000	0.017	0.000
Pseudo R^2	0.283	0.190	0.248	0.299
Area under ROC curve	0.893	0.813	0.849	0.860
Percent Correctly Specified	77.29%	71.11%	74.31%	78.46%
Range of Prediction	0 to 0.611	0 to 0.674	0 to 0.677	0 to 0.941
Significant Variables (two tailed, 0.10 or less)	# of Personnel Navy NSI	Acreage Per Capita Def Spend Navy	Acreage # of Major Bases Navy State Delegation Senate Armed Serv Senate Majority	# of Personnel Senate Armed Serv House Seniority Commission Var
Additional Significant Var one tailed, 0.10 or less)	Senate Armed Serv Senate Majority House Majority Defense Contrib	Army Senate Majority House Armed Serv NSI	Senate Def Cmt	

Model Two – Year Percent Change in Odds

Var of Interest	Model - "Year" - Percent Change in Odds			
	1988	1991	1993	1995
Acreage	-0.4	0.0 *	0.0 *	0.0
Total DoD Personnel	-22.1 *	0.0	0.0	0.0 *
Major Bases in State	2.4	3.7	-9.5 *	1.2
Per Capita Def Spending	-32.7	-0.1 *	0.1	0.0
Army	-8.8	-62.2 **	-49.3	233.3
Navy	-90.3 *	-64.6 *	151.0 *	17.1
State Delegation	-0.5	-1.5	19.3 *	0.6
Seanate Armed Serv	311.1 **	91.3	676.4 *	-75.5 *
Senate Def Committee	14.1	50.9	285.1 **	-5.7
Senate Majority	-49.1 **	-44.5 **	302.4 *	84.3
Senate Seniority	-9.3	1.8	5.3	-1.6
House Armed Serv	424.8	-72.3 **	-4.5	33.5
House Def Committee	dropped	-41.8	319.0	dropped
House Majority	-79.2 **	-33.4	30.6	52.2
House Seniority	-0.9	-3.9	1.4	6.1 *
Defense Contributions	-5.9 **	0.0	0.0	0.0
NSI	-2.6 *	-1.7 **	0.2	-1.5
Commission Var	dropped	318.6	9.6	3135.1 *
Presidential Var	-46.1	9.1	-32.2	1.2
Bases with Similiar Miss	0.9	0.6	-0.4	0.2
Mission Var	19.7	88.0	91.2	-37.1

* = signficant at 0.10 or better (two-tailed z-test)

** = significant at 0.10 or better (one-tailed z-test)

Model 2 – Service Summary

Area of Interest	Model - "Service"		
	Air Force	Army	Navy/Marines
Number of observations	342	342	512
Log Liklihood	-60.006	-67.659	-105.7274
Wald chi2	65.87	34.28	43.77
Prob>chi2	0.000	0.017	0.001
Pseudo R^2	0.365	0.221	0.155
Area under ROC curve	0.918	0.842	0.794
Percent Correctly Specified	80.990	74.270	69.140
Range of Prediction	0 to 0.799	0 to 0.604	0 to 0.668
Significant Variables (two tailed, 0.10 or less)	Acreage Senate Armed Serv Senate Def Cmt House Armed Serv Commission Var Presidential Var Mission Var	Per Capita Def Spend Senate Majority NSI	# of Major Bases State Delegation Senate Armed Serv Senate Majority Senate Seniority Defense Contrib Presidential Var
Additional Significant Var one tailed, 0.10 or less)	State Delegation	# of Personnel Presidential Var	Acreage House Armed Serv Bases w/ Sim Mission Mission Var

Model Two – Service Percent Change in Odds

Var of Interest	Model - "Service" - Percent Change in Odds		
	Air Force	Army	Navy
Acreage	-12.5 *	-1.0	-3.7 **
Total DoD Personnel	-4.3	-14.8 **	0.3
Major Bases in State	-1.1	4.4	-7.7 *
Per Capita Def Spending	-43.6	-68.5 *	20.7
State Delegation	6.9 **	-5.0	13.1 *
Seanate Armed Serv	395.0 *	38.8	-57.3 *
Senate Def Committee	393.2 *	-55.2	-41.0
Senate Majority	29.1	-48.0 *	74.0 *
Senate Seniority	-5.0	-4.2	5.3 *
House Armed Serv	-79.5 *	38.4	109.9 **
House Def Committee	-15.6	421.0	37.5
House Majority	-45.0	-37.5	23.3
House Seniority	1.4	-0.5	2.1
Defense Contributions	-1.2	-0.3	-2.8 *
NSI	-1.0	-1.6 *	0.2
Commission Var	1022.1 *	512.8	264.6
Presidential Var	3358.0 *	-61.3 **	-58.9 *
Bases with Similiar Miss	-0.9	-1.4	1.7 **
Mission Var	372.2 *	128.5	-62.4 **

* = signficant at 0.10 or better (two-tailed z-test)

** = significant at 0.10 or better (one-tailed z-test)

Model 2 – Major Bases as Defined by the Pentagon

Area of Interest	Pentagon Definition of Major Facility
Number of observations	617
Log Liklihood	-110.768
Wald chi2	56.63
Prob>chi2	0.0000
Pseudo R^2	0.224
Area under ROC curve	0.854
Percent Correctly Specified	73.740
Range of Prediction	0 to 0.520
Significant Variables (two tailed, 0.10 or less)	Acreage House Armed Serv House Majority Commission Var
Additional Significant Var one tailed, 0.10 or less)	State Delegation NSI Mission Var

Model 2 – Pentagon Major Bases Change in Odds

Var of Interest	Percent Change in Odds
Acreage	-5.8 *
Total DoD Personnel	-2.4
Major Bases in State	1.7
Per Capita Def Spending	-52.3
Army	-36.5
Navy	12.4
State Delegation	-98.4 **
Seanate Armed Serv	34.7
Senate Def Committee	50.8
Senate Majority	23.3
Senate Seniority	1.0
House Armed Serv	-57.0 *
House Def Committee	-59.2
House Majority	-54.2 *
House Seniority	-0.3
Defense Contributions	-1.2
NSI	-0.9 **
Commission Var	458.0 *
Presidential Var	92.3
Bases with Similiar Miss	0.4
Mission Var	94.4 **
* = signficant at 0.10 or better (two-tailed z-test)	
** = significant at 0.10 or better (one-tailed z-test)	

Appendix 8 – List of Bases included in the Projection Database

Alabama
Anniston Army Depot
Birmingham IAP AGS
Dannelly Field AGS
Fort Rucker
Gunter AFS
Maxwell AFB
Redstone Arsenal

Alaska
Eielson AFB
Elmendorf AFB
Fort Richardson
Fort Wainwright
Kulis Air Guard Station
MTA Camp Carroll

Arizona
Davis-Monthan AFB
Fort Huachuca
Luke AFB
Marine Corps Air Station, Yuma
Phoenix Sky Harbor IAP AGS
Tucson IAP AGS
Yuma Proving Ground

Arkansas
Fort Chaffee
Fort Smith Regional Apt AGS
Little Rock AFB
MTA Camp Robinson
Pine Bluff Arsenal

California
Beale AFB
Channel Islands ANG Base
Def Distr Reg West Sharpe
Def Distr Reg West Tracy
Edwards AFB
Fleet & Industrial Supply Center
Fleet ASW Training Ctr, Pac
Fleet Combat Tng Ctr, Pac

California (cont)
Fresno Air Terminal AGS
Los Angeles AFB
MC Air Ground Combat Ctr 29 Palms
MC Air Station, Camp Pendelton
MC Base, Camp Pendleton
MC Logistics Base, Barstow
MC Recruit Depot, San Diego
NAS Lemoore
NAS Miramar
NAS North Island
NAV Const Bn Ctr, Pt Hueneme
NAV Sub Base, San Diego
Naval Air FAC, El Centro
Naval Air Warfare Cntr Weapons Div
Naval Hosp, Camp Pendelton
Naval Postgraduate School
Naval Station, San Diego
Naval Weapons Station, Corona
NAVMEDCEN San Diego
NTC And Fort Irwin
Onizuka AS
Presidio Monterey
Sierra Army Depot
SPAWARSYSCEN
SWNAVFACENG COM
Travis AFB
Vandenberg AFB
Weapons Station, Seal Beach

Colorado
Buckley AGB
Cheyenne Mountain
Fitzsimons AMC
Fort Carson
Peterson AFB
Schriever AFB
USAF Academy

Connecticut
Bradley IAP AGS
Naval Sub Base, New London

Delaware
Dover AFB
New Castle County Apt AGS

Florida
Cape Canaveral AS
Eglin AFB
Hurlburt Field
Jacksonville IAP AGS
MacDill AFB
NAS Jacksonville
NAS Key West
NAS Pensacola
NAS Whiting Field
Naval Station, Mayport
NAVHOSP Pensacola
NAVSURFWARCEN
Patrick AFB
PWC Pensacola
Tyndall AFB

Georgia
Dobbins ARB
Fort Benning
Fort Gillem
Fort Gordon
Fort McPherson
Fort Stewart
Hunter Army Airfield
MC Logistics Base ICP
Moody AFB
NAS, Atlanta
Naval Sub Base, Kings Bay
Robins AFB
Savannah IAP AGS

Hawaii
COMNAVBASE Pearl Harbor
FISC Pearl Harbor
Fort Shafter
Helemano Radio Station
Hickam AFB
MCAS, Kaneohe Bay
Naval Computer & Telecomm
Naval Station, Pearl Harbor
Pearl Harbor Naval Shipyard
PWC Pearl Harbor
Schofield Barracks Military Res
Tripler Army Medical Center
Wheeler Army Airfield

Idaho
Boise Air Terminal AGS
Mountain Home AFB

Illinois
Capital Airport AGS
Charles Melvin Price Spt Ctr
Great Lakes Naval Trng Cntr
Greater Peoria Regional Apt AGS
Naval Hospital Great Lakes
PWC Great Lakes
Rock Island Arsenal
Scott AFB
Sheridan Reserve Complex

Indiana
Crane Div, NAV Surf Warfare Cntr
Fort Wayne IAP AGS
Hulman Regional Apt AGS

Iowa
Des Moines Reserve Complex
Des Moines IAP AGS
Sioux Gateway Airport AGS

Kansas
Forbes Field AGS
Fort Leavenworth
Fort Riley

Kansas (cont)
McConnell AFB

Kentucky
Bluegrass Army Depot Activity
Fort Campbell
Fort Knox
Louisville IAP AGS

Louisiana
Barksdale AFB
Fort Polk
NAS New Orleans /Joint Reserve

Maine
Bangor IAP AGS
NAS Brunswick

Maryland
Aberdeen Proving Ground
Adelphi Laboratory Center
Andrews AFB
Fort Detrick
Fort Meade
Martin State AGS
National Naval Med Center
NAV Surf War Center
NSWC, Indian Head Div
NAVAIR War Ctr Aircraft Div
US Naval Academy

Massachusetts
Barnes MAP AGS
Hanscom AFB
Otis AGB
Soldier Systems Center
Westover ARB

Michigan
Detroit Arsenal
Selfridge AGB
U.S. Army Garrison
W. K. Kellogg Airport AGS

Minnesota
Duluth IAP AGS
Minneapolis-St Paul IAP ARS

Mississippi
Columbus AFB
Gulfport-Biloxi Regional Apt AGS
Jackson IAP AGS
Keesler AFB
Key Field AGS
NAS Meridian
NAV Const Bn Ctr, Gulfport
Naval Station Pascagoula

Missouri
Fort Leonard Wood
Jefferson Barracks AGS
Lambert-St Louis IAP AGS
Rosecrans Memorial Airport AGS
Whiteman AFB

Montana
Great Falls IAP AGS
Malmstrom AFB

Nebraska
Lincoln MAP AGS
Offutt AFB

Nevada
Indian Springs AFS
NAS Fallon
Nellis AFB
Reno-Tahoe IAP AGS

New Hampshire
Portsmouth Naval Shipyard

New Jersey
Atlantic City IAP AGS
Fort Dix
Fort Monmouth
McGuire AFB
Naval Air Warfare Cntr, Lakehurst
Naval Weapons Station, Earle

New Jersey (cont)
Picatinny Arsenal

New Mexico
Cannon AFB
Holloman AFB
Kirtland AFB
White Sands Missile Range

New York
F. S. Gabreski Airport AGS
Fort Drum
Fort Hamilton
Hancock Field AGS
Niagara Falls IAP ARS
Schenectady County Apt AGS
Stewart IAP AGS
Watervliet Arsenal
West Point Mil Reservation

North Carolina
Charlotte/Douglas IAP AGS
Fort Bragg
MC Air Station, Cherry Point
MC Base, Camp Lejeune
NAVHOSP Camp Lejeune
Pope AFB
Seymour Johnson AFB

North Dakota
Grand Forks AFB
Hector IAP AGS
Minot AFB

Ohio
Defense Construction Sup Ctr
Mansfield Lahm MAP AGS
Springfield-Beckley MAP AGS
Toledo Express Airport AGS
Wright-Patterson AFB
Yngstwn-Warren Reg Apt ARS

Oklahoma
Altus AFB
Fort Sill

Oklahoma (cont)
McAlester AAP
Tinker AFB
Tulsa IAP AGS
Vance AFB
Will Rogers World Apt AGS

Oregon
Kingsley Field AGS
Portland IAP AGS
Umatilla Chem Depot Act

Pennsylvania
Carlisle Barracks
Charles E. Kelly Support Fac
Defense Distrib Region East
Fort Indiantown Gap
Harrisburg IAP AGS
Letterkenny Army Depot
NAS Willow Grove
NAVSURFWARCEN
Pittsburgh IAP ARS
Tobyhanna Army Depot
Willow Grove ARS

Rhode Island
Naval Station Newport
Naval AMBCARE Center
Quonset State Airport AGS

South Carolina
Charleston AFB
Fort Jackson
MC Air Station, Beaufort
MC Recruit Depot
McEntire AGS
NAV Weapons Sta, Goose Creek
NAVHOSP Branch Clinic
Shaw AFB

South Dakota
Ellsworth AFB
Joe Foss Field AGS

Tennessee
McGhee Tyson Apt AGS
Memphis IAP AGS
Nashville IAP AGS
Naval Hospital, Millington
NAVSUPPACT Memphis

Texas
Brooks AFB
Dyess AFB
Ellington Field AGS
Fort Bliss
Fort Hood
Fort Sam Houston
Goodfellow AFB
Lackland AFB
Laughlin AFB
NAS Corpus Christi
NAS Kingsville
NS Ingleside
Randolph AFB
Red River Army Depot
Sheppard AFB

Utah
Desert Chemical Depot
Dugway Proving Ground
Hill AFB
Salt Lake City IAP AGS
Tooele Army Depot

Vermont
Burlington IAP AGS

Virginia
COMNAVBASE Norfolk
Defense Gen Supply Center
FISC Norfolk
Fort A. P. Hill
Fort Belvoir
Fort Eustis
Fort Lee
Fort Monroe
Fort Myer

Virginia

Fort Story
HQMC, Henderson Hall
Langley AFB
LANTNAVFACENGCOM Norfolk
MCB Quantico
NAS Oceana
NAV Amphib Base Little Creek
Naval Med Center
Naval Station, Norfolk
Naval Surface Warfare Center
Naval Weapons Station, Yorktown
NAVSUPPACT Norfolk
Norfolk Naval Shipyard
PWC Norfolk
Richmond IAP AGS

Washington

Fairchild AFB
FISC Pudget Sound Bremerton
Fort Lewis
McChord AFB
NAS, Whidbey Island
Naval Hospital Bremerton
Naval Station Everett
Naval Submarine Base, Bangor
Naval Undersea Warfare Cntr Div
Puget Sound Naval Shipyard
Yakima Training Center

West Virginia

EWVR/Shepherd Fld AGS
Yeager Apt AGS

Wisconsin

Fort McCoy
General Mitchell IAP ARS

Wyoming

Cheyenne Apt AGS
Frances E. Warren AFB

Curriculum Vitae

Brian T. Kehl was born at Wright-Patterson AFB, in Dayton, Ohio. The son of a career Air Force Officer, he grew up moving to a new location every three to four years. He graduated from Redlands High School in 1987 and enrolled at the University of California at Riverside and Harvey Mudd College. After two years of pre-engineering studies, he served a two year mission for his Church and then transferred to Brigham Young University.

Captain Kehl graduated in 1994 from Brigham Young University with a Bachelor of Science Degree in Accounting and minors in Physics, Business Management, and Aerospace Studies and earned his Air Force commission through the Reserve Officer Training Corps program. His first assignment was at Arnold Engineering Development Center located at Arnold AFB, Tennessee. While there, he served as both a Budget Analyst and as Chief of the Commander's Action Group. He enrolled in the Air Force Institute of Technology's Graduate Cost Analysis program in May 1997. After graduating with high honors, he was assigned to first the Launch Vehicle Program Office and then the Global Positioning System Joint Program Office at the Space and Missile System Center, Los Angeles AFB, California. In L.A. he worked as a Senior Cost Analyst and as Chief of Cost Research for the GPS program. Captain Kehl also worked as the chief cost analyst of the DoD's new combat radio for downed aviators – the Combat Survivor Evader Locator.

Captain Kehl entered George Mason University in the fall of 2000 under Air Force sponsorship. Upon graduation he will join the Air University faculty at Maxwell AFB in Montgomery Alabama. His duties will include teaching graduate level economics to senior military and civilian comptrollers across all services of the Department of Defense.